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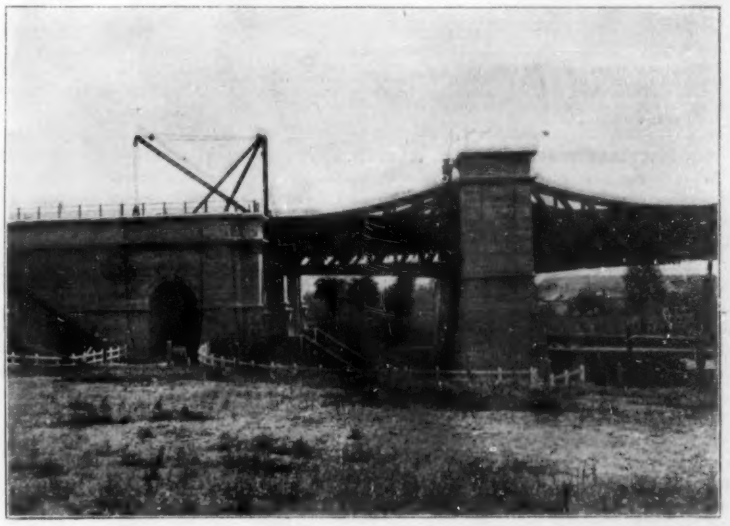
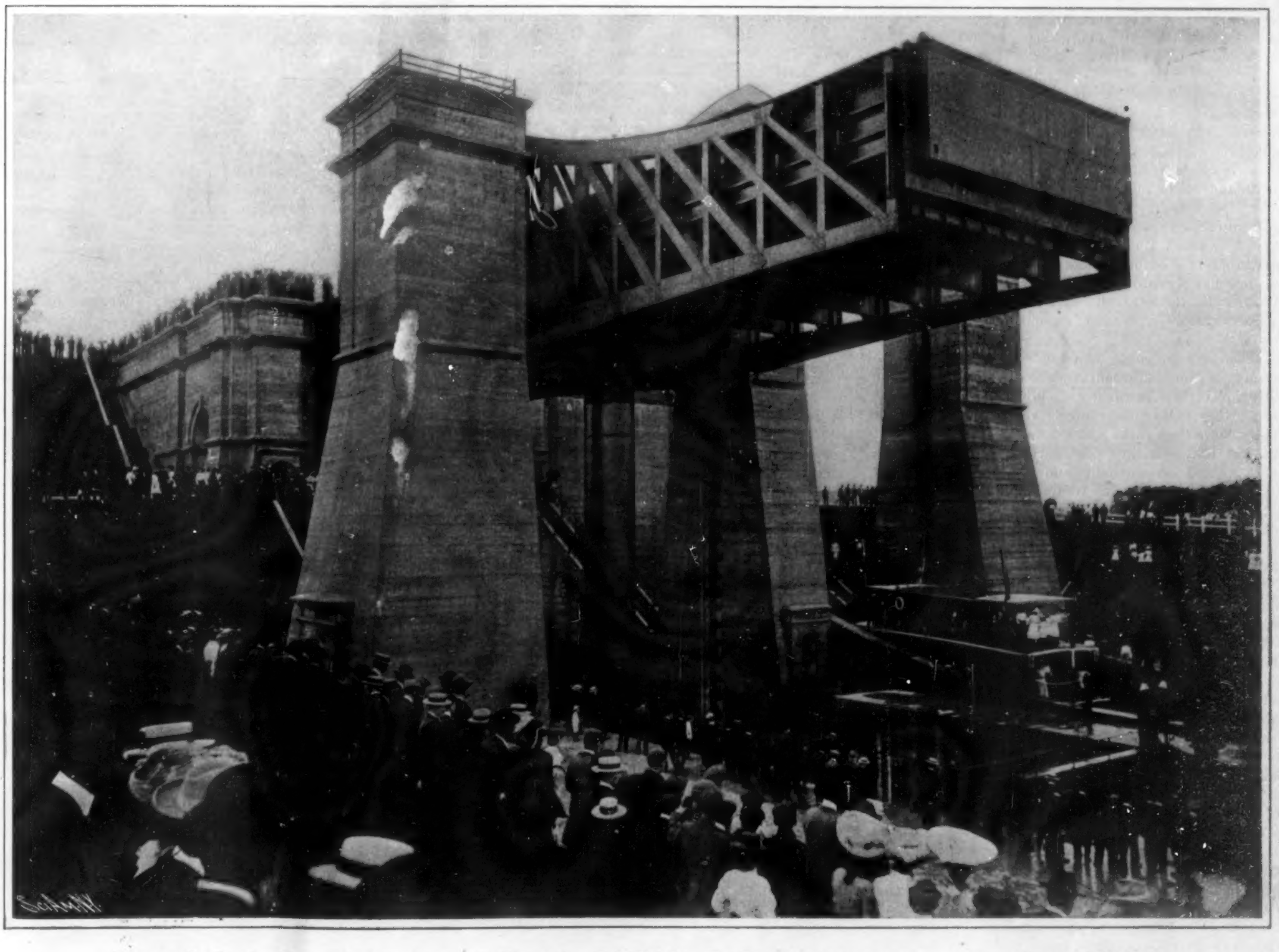
Peterborough Lock in Course of Construction.



A General View of One of the Peterborough Locks.



View on the Opening Day. The West Chamber is Elevated to Full Height. The East Chamber Contains a Steamer About to be Raised.

THE PETERBOROUGH LIFT-LOCK OF THE TRENT VALLEY CANAL.—[See page 8.]

SCIENTIFIC AMERICAN

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NEW YORK, SATURDAY, JULY 7, 1906.

The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

VOLCANIC ACTIVITY AND RADIUM.

Were it not for the fact that Major C. E. Dutton is considered one of the foremost authorities on earthquakes and volcanic activity in this country, his new theory of volcanic activity, published in the pages of a monthly scientific review, would probably be received with scant attention, although his arguments are both ingenious and plausible. Almost every natural phenomenon which has been inadequately explained by the theories at present in vogue, has latterly been attributed to some form of radio-activity.

Major Dutton starts with the fundamental proposition that our present conception of a volcano, which is that of a safety-vent, is inapplicable to the conditions which we know exist. The earth is no longer regarded as an immense sphere of liquid or semi-liquid material surrounded by that solid crust of indeterminate thickness which constituted the interesting but unconvincing teachings of our schools and colleges some twenty years ago, but as a fairly solid globe. Furthermore, the discharged masses of any single volcano are hardly sufficient to bear out the existing theory, which can be proved simply enough. Draw a segment of a section of the earth, and plot upon it to scale a section of a volcanic lava reservoir. Severe as many eruptions concededly are, it will be found that the quantity of lava discharged from the plotted volcano will only in exceptional cases be more than two or three cubic miles. To be sure, masses as high as six cubic miles have been estimated, but such a discharge is unusual. An investigation of this character must show how small, indeed, is the amount of lava expelled for the amount of activity manifested.

If we conceive a volcano to be nothing more or less than the geological safety valve of our schooldays, why is it that one eruption does not immediately reduce the internal pressure and render the volcano dormant? We find, on the other hand, that eruptions constantly recur before and after an outburst of maximum force.

If we may judge from a study of the relative intensity of the disturbances caused by eruptions, we are more or less justified in holding, as Major Dutton states, that a lava reservoir is very shallow, perhaps rarely more than three miles deep. When we consider the fact that seismic disturbances, as a general rule, increase to a certain point and then subside, we may assume that there is a gradual development of volcanic heat and a gradual diminution. At the point of maximum temperature the steam invariably contained in lava exerts its greatest pressure, and forces out the lava in an eruption of more or less violence.

Dismissing the old conception that the material discharged was maintained in a molten condition for ages after the earth cooled down; dismissing, too, the idea that the lava reservoirs are but the projections of a central molten mass, because such projections would have solidified millions of years ago; and dismissing further the doctrine that the cause of volcanic activity is steam generated at great depths, because steam would be unable to lift the thousands of tons of rock above it, Major Dutton holds that the heat must be generated in or surrounding molten lava.

The next step is to ascertain what may be the cause of this internal heat. Major Dutton finds in radium a substance which has all the properties that he seeks. It is admitted that the earth contains either radium or radio-active minerals. The calculations which have been made, rough, to be sure, but still sufficiently accurate for the purpose in hand, tend to prove that the heat developed by subterranean radium is far greater than can be radiated into space under normal conditions. The only weak point in the theory is the amount of radio-active material which must be contained in a volcanic reservoir to produce disturbances as violent as those which have been recorded in historic times. Furthermore, there is the difficulty of the relatively short life of radium; but this, it must be confessed, is overcome by granting its constant reformation from some material such as uranium, a supposition which the latest views of physicists justify.

Whether or not we accept the theories which Major Dutton has advanced, we must at least admit that they are as plausible as the theories which have dominated geological teaching for the last half century.

THE CAPTURE OF A LIVE OKAPI.

Great interest has been aroused in English scientific circles by the recent communication from Capts. Boyd-Alexander and G. B. Gosling, who are making a tour of exploration through the Congo, that the party has secured a specimen of the okapi. The animal was secured in the district of Angu on the River Welle by the captains' Portuguese collector. The latter made several attempts to obtain the animal by means of the rifle, but it was too wary and nimble. At last the Portuguese resorted to the native trapping methods, by digging a pit in which a specimen ultimately fell. Capt. G. B. Gosling has also gathered some definite data concerning the somewhat speculative nature and habits of the okapi. He states that it is generally found singly and sometimes in pairs, but according to the Mombatti hunters, groups of three have been seen on rare occasions. He also remarks that the okapi frequents haunts where there is a small stream of water surrounded with muddy and swampy ground. In such regions there thrives a certain plant with a very large leaf, growing on a single stalk, and which invariably attains a height of some ten feet. This leaf constitutes the favorite food of the creature, and Capt. Gosling ventures to suggest that the animal is only to be found in those districts where this plant exists. The creature feeds and prowls around through the swamps during the night, since it is never observed in the daytime. It has, however, been seen feeding by the natives up to as late as eight o'clock in the morning, but very rarely. During the day the animal lurks in the fastnesses and seclusion of the forest, venturing abroad in search of food at dusk. Capt. Gosling on three occasions observed the animal busily feeding, and was able to approach quite close to it without frightening it away, so that he was able to follow its movements and habits among the swamps with perfect ease. Capt. Gosling is the first white man to see the okapi alive, and it is anticipated as the result of his close observations, that he will be able to contribute extensively to our meager knowledge of the animal. On these occasions at first it could hardly be discerned, so carefully was it concealed in the swamp vegetation. The animal is possessed of remarkably acute hearing, and on this account the Mombatti natives class it among the bush-buck, the local name of which is "bungana." Owing to its extreme wariness, even the natives, who are born hunters, very rarely succeed in running it to earth, the most successful methods of securing it being by means of the pit trapping. The dead specimen that has been procured will probably be forwarded to one of the English museums, since it is stated to be in excellent condition.

A NEW BLOWPIPE WELDING PROCESS.

One of the most recent improvements in the use of the blowpipe on an industrial scale for the melting and welding of metals and performing different operations at a high heat has been brought out at Paris by the Société l'Oxhydrique. For a long time inventors sought for a good system of blowpipe which would give a complete combustion of the hydrogen, acetylene, or other gas in the oxygen, and especially to form a homogeneous flame. But the fear of explosion prevented them from operating the mixture of the two gases before burning them, and the gases were brought by two separate tubes, either parallel or converging. Under these conditions the flame was composed of regions having quite a different nature. In the present case, the inventors succeed in mixing the two gases in the body of the blowpipe itself, before the burning. Completely mixed the molecules of oxygen and combustible gas arrive at the flame in the proper proportions for a complete combustion. As to how the inventors were able to prevent the explosion of the mixture which is thus formed, we find that it is by giving to the gas mixture a speed which is higher than the rate of propagation of the flame. Since the researches of the Fire-damp Commission, we find that an explosive mixture inclosed in a tube does not inflame at once throughout the entire tube. From one end of the tube, the ignition goes to the other at a certain speed which increases as the square of the tube section. If the gaseous mass moves toward the ignition point at a higher speed than this, the fire will not reach the inside of the tube. The application of this discovery to a blowpipe is very simple, but it required some one who should think of it, as always happens. That the idea is new is evidenced by the patents which the company has obtained in the leading countries. It has been using the apparatus for the last few years with great success. This latter is of simple form, and the blowpipe consists merely of a long conical nozzle at the large end of which the gases are introduced by two openings. A rubber tube passes from each inlet to a gas cylinder provided with valves and pressure gages combined with gas-expanders. Oxygen and hydrogen are used. In the larger form, the rubber tubes go from the cylinders to a common mixing chamber and from this a single tube passes to the blowpipe. The lighter form of blowpipe weighs only half-a-pound, while the acetylene blowpipes weigh several times this. The new system is specially useful for welding tubes, sheet steel pieces, boiler work, etc. A remarkable application is that of cutting metals, and a round piece is cut out by the flame from a one-inch steel plate at the rate of one foot per minute. By using a compass-like device which brings the flame down on the plate and rotates it around, the circular disk is cut out of the thick plate like a saw cutting a soft plank, and the gap which it leaves is scarcely wider than a saw-cut. The outlying metal is not affected, as the blowpipe action is quite local.

THE VAGARIES OF WELLS.

According to the observation of M. Grosseteste upon some of the wells which are situated in the canton of Geneva, it appears that the wells have the remarkable property of drawing in air at certain times and of blowing out air at other periods. These wells are considered by the inhabitants of these districts as very exact indications of the weather. When the wells blow out air, it is a sign that rain is to follow, and when air is drawn in, it is a sure indication of fine weather. Since the wells are covered with a flat stone having a hole in it, according to the custom of the region, it is easy to observe the direction which is taken by the current of air. Some observers installed upon one of the wells a pressure-gage of U-form and were thus able to find some interesting points about the air-currents. Thus they find that a well is very seldom in a state of equilibrium. It blows out when the barometer falls, and sucks in air when it rises. These variations do not exceed a height of one inch on the gage. As to the theory of the action of these wells it is to be remarked that they lie in strata of alluvial gravel covered with vegetable earth which is quite or nearly impervious to water. We may therefore admit that owing to the spaces which exist between the stones of the gravel, these strata form a reservoir of great capacity in which the water circulates. The water comes into the cavities when the atmospheric pressure is lowered, and it leaves them when the pressure rises. The effect of these movements is thus felt within the well, inasmuch as the latter forms the connecting point with the outer air. This phenomenon may be said to have a considerable analogy with the emission of gases by certain hot springs, to caves where a current of air circulates upon the ground, to the variations in the flow of springs, and other phenomena of a like nature.

NERVE IMPULSES AND THEIR PROPAGATION.

In a paper on the propagation of nerve impulse, published in the American Journal of Physiology, W. Sutherland gives it as his opinion that the electrical properties of nerves have received much attention, and the present hypotheses of nerve impulse propagation, though seemingly purely mechanical, are in reality to be regarded as electrical also. For though he refers the "conductivity" of nerve to the rigidity of its substance, he has previously given electrical explanations of cohesion and rigidity. Two lines of thought lead to a conception of the possible importance of rigidity in the phenomena of nerve and muscle. In the first place it is known that a jelly offers but little more resistance to the passage of a small ion than does pure water at the same temperature, despite the enormous difference in the large-scale viscosities of the two media. This proves that in a jelly the molecules of the gelatine form a mesh dividing the jelly into compartments with network walls which confine the molecules of water in batches. The cellular structure gives to the jelly its rigidity, yet the meshes are so open that an ion urged forward by electric force has little difficulty in passing from one compartment to another, and encounters most of its resistance in passing through the batches of water molecules. Thus the jelly has rigidity on the molar scale, and fluidity on the molecular. Just as an ion moves through the jelly almost independently of the presence of the network, there ought to be phenomena of the jelly confined to the network as regards cause and effect. How would it be possible to propagate disturbance through a jelly without appreciably affecting its contained water, as a diver signals by his rope to the man in charge of the air pump. It seemed to Mr. Sutherland that muscular contraction and nerve conductivity might be physiological answers to this query. The second line of thought regards the slowness of the propagation of nerve impulse as probably connected with the small rigidity of the soft tissues in the animal body.

STATISTICS OF TURBINE-PROPELLED VESSELS, MAY 1, 1906.

In 1894 a small vessel of astonishing speed made its appearance among the British fleet in the harbor of Spithead. This was the experimental turbine steamer "Turbinia," of about 100 feet length and 44 tons displacement, and driven by Parsons turbines. The construction of that vessel marks the beginning of the contest between the marine reciprocating engine and the marine turbine, in which the latter has been steadily gaining.

The reciprocating engine has about reached the limit of its efficiency, and is susceptible of little further improvement. The "Kaiser Wilhelm II.," one of the newest of the four great German steamers which have held the speed record since 1897, has four quadruple-expansion engines, yet she is little faster than the oldest of the four, the "Kaiser Wilhelm der Grosse," which has only two triple-expansion engines.

The turbine, especially the Parsons turbine, possesses the merit of comparatively small height—a great advantage in warships, where the height of the engine is limited to a maximum of about 26 feet by the necessity of putting it under the armored deck. Consequently, turbines appealed strongly to naval constructors, despite the waste of fuel and other defects observed in the earliest turbine vessels.

But there were dissenting voices. Chief Constructor Melville, of the U. S. navy, pointed out, in 1901, the excessive vibration of the turbine steamer "King Edward," while in 1905 the chief constructor of the North German Lloyd, after crossing the Atlantic in the turbine steamer "Victorian," reported that turbines were unsuitable for large vessels, that they saved neither space, weight, nor fuel, and possessed only one advantage—that of diminishing vibration!

After making numerous experiments, neither systematic nor very thorough, England has taken the bold step of equipping her newest and largest warships and auxiliaries—the battleship "Dreadnought" and the subventioned Cunard liners "Lusitania" and "Mauritania"—with Parsons turbines. The Cunarders, with a length of 790 feet, 40,000 tons displacement, 60,000 horse-power, and a speed of 25 knots, will be the largest and swiftest merchant vessels afloat; while the "Dreadnought," which was launched in February, 1906, and will have a displacement of 18,289 tons, engines of 23,000 horse-power, a speed of 21 knots and a battery of ten 12-inch guns, will be the largest, swiftest, and most formidable of warships. It is rumored that the British Admiralty intends to equip all new warships with turbines. The only large turbine vessel now in the British navy is the 3,000-ton cruiser "Amethyst." There are also two turbine-driven destroyers, "Velox" and "Eden," while two others, "Viper" and "Cobra," have been wrecked. The merchant fleet of England includes many turbine vessels, nearly all of which have Parsons turbines. The oldest is the Clyde passenger steamer "King Edward," built in 1901. Three years later appeared the "Manxman," of 2,100 tons, 8,500 horse-power, and 23 knots, and the Allan liners "Victorian" and "Virginian," of 11,200 tons. In 1905 the Cunarder "Carmania," 878 feet and 30,000 tons, was launched. Two more 11,000-ton turbine vessels are being constructed for the Allan Line, and the royal turbine yacht "Osborn" is also under construction.

In Germany the Parsons turbine was adopted for the 3,000-ton cruiser "Lübeck," launched in 1904, and torpedo boat "S 125." The performances of both have been satisfactory, though not startling, and in December, 1905, Parsons turbines were ordered for another torpedo boat and the cruiser "Ersatz Wacht," of 13,600 horse-power. The government has also chartered the Hamburg-American liner "Kaiser," which has Curtis turbines.

France has been still more cautious. An experimental vessel, the "Libellule," built in 1905, and torpedo boat "No. 243" have Rateau turbines, while "No. 293" has Parsons and "No. 294" has Laval turbines. No larger naval vessels have been equipped with turbines.

In the United States the scouts "Salem" and "Chester" and the Pacific liner "Creole," of 10,323 tons, have turbines. Italy is building a turbine-driven armored cruiser, the "St. George," and Russia has an experimental 160-ton vessel with Rateau turbines. Japan, confidently following England's lead, has ordered in England Parsons turbines for two new battleships, the "Satsuma" and the "Aki."

It appears, therefore, that turbines have not yet replaced marine cylinder engines extensively except in England, but the reduced height and bulk and other advantages of turbines, together with the impossibility of improvement in cylinder engines, must eventually cause England's example to be followed by other nations.

Within three weeks nearly thirty tons of gold specie have been transferred from England to America.

A CASE OF ALLEGED REASONING IN A DOG.

Wilhelm Ament in Arch. f. d. ges. Psychol. relates an anecdote concerning the behavior of a dog, a two-year-old "Zwergpinscher." According to Ament, the dog was accustomed to sit on a chair in front of a window overlooking neighboring houses and yards. One cold day the window was so thickly coated with frost that the dog could not enjoy his customary view. Confronted with this situation, the dog proceeded to lick the frost until a round area about the size of a plate had been cleared away with some difficulty. The dog then took up the more natural canine occupation of watching the cats in the adjoining yard. Several times during the winter the window was similarly cleaned for the same purpose.

Ament, being a psychologist, endeavors to explain this interesting bit of natural history. In very dignified and involved German he concludes that by means of the experience of wiping with its snout, the dog hit upon the licking away of at first the softened layers of ice, and later of the more solidly frozen ones. That the dog straightway hit upon the method of licking Ament does not consider surprising when we remember how often during the day a dog licks himself, everybody, and everything. Ament believes that, all things considered, we seem to have here the correlation of the series of experiences or ideas partly different from one another (wiping with the snout, licking with the tongue), partly analogous (licking away of other things and the licking away of frost on the window) with an end in view (namely, looking through the window).

JAPANESE EARTHQUAKE THEORIES.

While appreciating the value of the researches of Nagaoka, Kusakabe, and Otani, F. Omori, in an article published in the Physico-Mathematical Soc., Tokyo Proc., cautions one against applying the results of their experiments on the elastic and other properties of rocks to the explanation of earthquake phenomena. Kusakabe argues that earthquake vibrations of small amplitude should travel faster than those of larger amplitude. But the velocity of the third phase of the prominent portion of earthquake motion is always 3.3 km. sec., be the earthquake small or large, the vibrations sharp or slow and insensible. According to Nagaoka's views on secondary vibrations the periods of earthquake vibrations should always become longer with increased amplitude; but this the author shows, by examples, does not hold either, the periods remaining practically constant during the principal and the end portions. Moreover, the displacements would be very small and within the elastic limit of rocks. Nagaoka replies to Omori. Statical and kinetic experiments must be distinguished. The quantity, displacement-wave-length, referred to by Omori is arbitrary in vibrating systems, and the objection meaningless. By tapping prisms of sandstone periodically, Kusakabe had obtained summation frequencies up to the eighth order, and difference frequencies up to the seventh order.

HOW ENGLAND DISPOSES OF OLD SHIPS.

The extent to which British shipowners dispose of old vessels to foreigners is shown in statistical tables published in Lloyd's Register of Shipping. The tonnage cleared off in this way last year was 512,701 tons, comprising steamships of 422,395 tons, and sailing vessels amounting to 90,306 tons. By these sales, which are the largest since 1900, Germany acquired 101,903 tons, Italy 78,671 tons, Japan 66,328 tons, and Norway 59,702 tons. It must be a very considerable advantage, from a British point of view, to have a market like this for "second-hand" vessels. Tables which are included in the registrar general's returns indicate that about 18 per cent of the tonnage removed from the Register because of foreign transfer was built before 1880, nearly 43 per cent before 1885, 62 per cent before 1890, 78 per cent before 1895, and over 90.6 per cent before 1900. In addition to the second-hand tonnage transferred to foreigners, 52,464 tons were transferred to British colonies during 1905, as compared with 37,464 tons in 1904, 62,907 tons in 1903, and 32,603 tons in 1902.

THE VISIBLE HEAVENS.

BY FREDERICK R. HONEY.

Probably the ordinary observer of the heavens does not realize how large a portion of the celestial sphere comes within the range of vision every twenty-four hours during the year. The popular impression in the minds of persons living in either hemisphere is that about one-half of the heavens (possibly a little more) is visible; whereas, at different points on the earth's surface, the proportion varies between one-half at either pole and the whole of the celestial sphere at the equator.

The circle $CPEP'$, Fig. 1, represents the celestial sphere, on the surface of which we may conceive that the stars are situated; P and P' being respectively the north and south poles of the heavens, and CE the celestial equator. The small circle may be taken to represent the earth, with the understanding that it is entirely out of proportion to the celestial sphere, i.e., it should be represented by a mere point. It is enlarged to illustrate the horizon of each pole, which is drawn parallel to CE. When the earth is represented by a point, these parallel lines coalesce and become coincident with the celestial equator. The reader will see that by an observer at either pole nothing can be seen beyond the celestial equator; one-half of the heavens, i.e., CPE, being continually within the range of vision of the observer at the north pole, while the observer at the south pole is limited to the other half, $CP'E$.

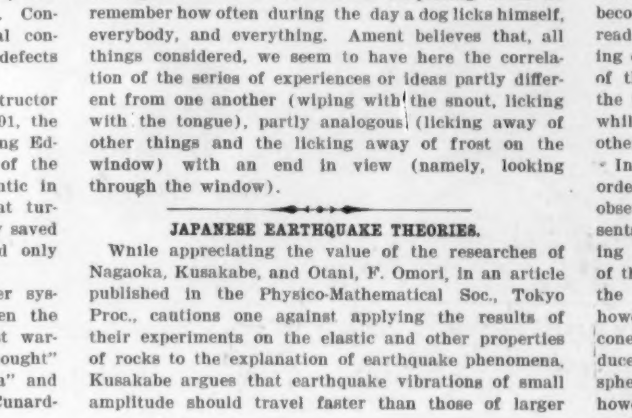
In Fig. 2 the drawing of the earth is enlarged, in order to exhibit clearly the range of vision of an observer residing in any latitude, e.g., ab, which represents the parallel of New York. The circle representing the celestial sphere is drawn within the limits of this page, in order that the reader may understand the explanation which follows. It will be evident, however, that the earth as well as the vertex of the cone touching it along the parallel ab would be reduced to a point in comparison with the celestial sphere. The size of the circle representing the latter, however, does not affect in any way the consideration of the proportion which is visible or invisible at a given latitude.

If we draw tangents to the circle at the points a and b, they will meet on the earth's axis produced at v; and if these lines be prolonged in the other direction, they will intersect the circle representing the celestial sphere at c and e. The horizon of a is cav produced until it intersects the celestial sphere at the point opposite to c; and the horizon of b is ebv prolonged to the point opposite to e. During one revolution of the earth the tangent vac generates a conical surface, which intersects the celestial sphere in the circle represented by the chord ce, and which is the limit of a zone of the heavens which is never visible to an observer residing at the latitude ab. The area of this zone is very small as compared with that of the entire heavens. The area of the zone cde is equal to that of a circle described with a radius equal to the chord cd. The latitude ϕ is equal to ϕ, which subtends this chord; therefore $cd = 2\sin\frac{\phi}{2}R$; and the area of the zone $= \pi\left(2\sin\frac{\phi}{2}R\right)^2$. The area of the surface of the celestial sphere $= 4\pi R^2$. Comparing these areas, the

$$\text{area of the zone} = \frac{\pi\left(2\sin\frac{\phi}{2}R\right)^2}{4\pi R^2},$$

which reduces to $\sin^2\frac{\phi}{2}$.

At the pole $\phi = 90$ deg.; and $\sin^2\frac{\phi}{2} = \sin^2 45$ deg. $= \frac{1}{2}$, i.e., one-half of the heavens is invisible. At the equator $\phi = 0$, and $\sin^2\frac{\phi}{2} = 0$; in other words, *no* portion of the celestial sphere is beyond the range of vision. At latitude 60 deg. $\sin^2\frac{\phi}{2} = \sin^2 30$ deg. $= \frac{1}{4}$, or one-fourth is invisible. At the latitude of New York $\phi = 40$ deg. 45 min. $\sin^2\frac{\phi}{2} = \sin^2 20$ deg. 22.5 min. $=$ 0.12+, or about $\frac{1}{8}$; i.e., seven-eighths of the heavens is within the range of vision every twenty-four hours throughout the year.



THE VISIBLE HEAVENS.

A good cement for switchboard repairs, where iron has to be fastened to marble, is said to consist of 30 parts plaster Paris, 10 parts iron filings, and half part of sal-ammoniac; it is mixed with vinegar to a fluid paste for use and made freshly, for it solidifies if allowed to stand.

AN ELECTRO-MECHANICAL COIN COUNTING AND WRAPPING MACHINE.

BY A. FREDERICK COLLINS.

Of the many labor-saving devices introduced into banking and business methods in recent years certainly not one of them is more successful in reducing to a minimum the amount of work involved than the coin counting and wrapping machine. Where a large number of coins have to be counted and wrapped by hand those who do the work must be highly skilled or there will be numerous errors, and this is especially true when the operators become fatigued. The machine illustrated in connection with this article was constructed by Edward Van Winkle, an electrical engineer, of New York city, and the speed and accuracy with which it counts and wraps coins is a matter of no little surprise to one who sees it in action for the first time.

A conception of what the machine can do can perhaps best be conveyed by comparing it with hand labor. The most proficient manual expert can count and wrap without error not more than one package of coins per minute, while the machine will wrap from eight to twelve packages per minute, depending upon the size of the coins. It is evident, therefore, that the machine will duplicate the work of eight or twelve persons, with the added advantage of absolute accuracy.

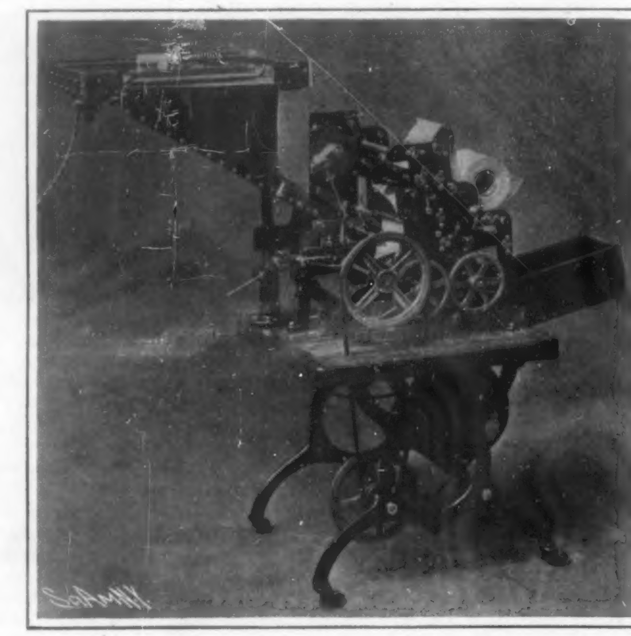
The machine, which is driven by an electric motor, is as nearly automatic as human ingenuity can make it, and its speed is limited only by the ability of the operator to scrutinize the coins and feed them into a hopper, and actual working tests have shown that at least three hundred coins can be looked over, and bad ones eliminated, every minute by a fairly rapid operator. A reference to the illustration will enable the reader to form a good general idea of how the money is counted and then wrapped, not by electricity exactly, but rather by a mechanism driven by an electric motor.

Flush with the top of the elongated hopper is a small table and on this the coins are placed. The operator spreads them out so that they may be quickly observed, individually and collectively, and in case there are any mutilated or counterfeit pieces among them they can be thrown out. This preliminary work accomplished they are merely pushed into the hopper and left to the machine to do the rest. From the hopper they are conducted by and through a conduit to a reciprocating push-bar, and here, regardless of thickness and diameter, they are brought together in a row preparatory to being wrapped. When the number of coins required to make a bundle, of say twenty half-dollars, are brought forward the last one registers the fact, and also sets the wrapping mechanism, inactive until now, into operation.

The coins, now counted and bunched, are carried by means of a holder from the buncher to the wrapper, the holder returning to its first position into which the coins are deposited ready for the next package. While the coins are thus being carried to the device which rolls them into packages the holder picks up and takes with it the end of the paper to be used in wrapping and which has been conveniently left behind by the package wrapped before it. At the same instant with this action the lower coin roll is thrown out of its normal position forming in consequence a recess or pocket with the two upper rolls, and into this the row or bunch of coins is transferred.

The roll returning to its first position, it, with the others, begins to revolve and the band of wrapping paper is drawn by friction around the bundle of coins, between it and the rolls, by the motion of the latter. Making two complete revolutions, the paper is wound tightly around the coins twice and projecting beyond them allows enough for the crimp. When the paper has been wrapped around the coins a V-shaped knife severs it from the roll of paper.

The final process consists of crimping the edges of the package, and this is done by turning them inwardly by the crimpers, these drawing the converging edges of the paper, made by the knife, in opposite directions, the result being a clean, smooth and mechanically perfect package in which neither paste nor glue is required as a fastener. Since all coins are not of the same thickness, naturally the length of the package varies for different coins; but whatever may be the length, the crimpers force the edges of the paper up tightly to the surface of the coins. When the crimping is completed the package resembles somewhat a cartridge, when it is ejected from the machine into a box, which may then be detached and carried wherever the packages of coin may be needed. One of the clever features about the machine-made wrapper is that, like a good safe, it is burglar-proof; that is to say, it is quite impossible to break into it and extract a coin without completely destroying the paper case in which it is wrapped. As the ends of the package are not sealed, it is unnecessary to write or print on the wrapper the value of the coin inside, as the denomination can be readily seen; if, however, such markings should be desired the roll of paper can be printed before it is put into the machine. The longest wrapper measures 7¾ inches long by 2⅝ inches wide, while the shortest wrapper is 4⅛ inches long by 2⅞ inches wide. The long wrappers are adapted to twenty-five-cent pieces, and the short ones to fifty-cent pieces. It is pointed out that the economy of paper can only be realized when one attempts to wrap the coins by hand in a wrapper that has been cut off by the machine.



AN ELECTRO-MECHANICAL COIN COUNTING AND WRAPPING MACHINE.

While Mr. Van Winkle designed and constructed the machine described, he was not the inventor, but developed it for one of his clients. He gives us this excellent version of its origin: "The inventor of the device had been connected with a 'penny-in-the-slot' machine company and was dependent for his living upon returns from several of these vending machines; his revenue was all in coin and he came to dislike the sight of it. He had three nail kegs in his room in which he deposited his daily collections, and if perchance he wanted to pay some bill by check he and all his family would have to stay up all night counting and wrapping these coins so that he could deposit them in the bank. His wife suggested in fun one evening, while his family were industriously wrapping in order to swell his bank account sufficiently to pay his rent, that he invent a way to count the coin by machinery and thus save the tedious hand labor."

Acting upon this suggestion he invented a machine, patented it and then built it, only to find on completion that it would not do the work commercially as it should. His general idea was good but the mechanical movements he utilized in developing it were not the proper ones. Instead of the three rotary rolls as now employed he used a loose belt to form a pocket; instead of crimping the ends he used glue to fasten the package, and finally instead of feeding the paper from below he fed it from above. Under more scientific treatment, however, all the defects were eliminated and a perfect coin counter and wrapper resulted. Thus a machine of great value has been brought about in one that otherwise would have ended in flat failure, and all due to simple but necessary changes.

The electric motor for running the new machine consumes but three-tenths of an ampere at 110 volts and connection is easily made by means of a light socket and a plug. A turn of a button switch starts or stops it as desired.

THE TAMENESS OF WILD ANIMALS.

BY CHARLES FREDERICK HOLDER.

That wild animals become extremely tame is well known. The wild quail of Southern California will enter gardens, and nest there; and in the protected season I have seen a flock standing in a country road, a jaunty male between them and my horse, not twenty feet away; moving only when I moved, and then with reluctance. Several years ago some residents on one of the channel islands of Southern California introduced a number of black-tailed deer which were protected to such extent that in time they discovered that they were privileged characters, and assumed nearly the absolute contempt for human beings held by the sacred bulls of India, that crowd men and women from the road. They persisted in entering gardens, day and night, destroying the plants, and finally to locate them the dwellers on the island had bells fastened to them. One buck made his home near the town of Cabrillo and walked about the place and over the hills with the freedom of a dog. When a boat landed off the pier the buck ran down to greet the newcomers and share their lunch, and became a welcome guest at barbecues and lobster and clam bakes. As time went on this deer through attention became extremely arrogant and began to resent any lack of attention; in a word, like many persons, he could not stand prosperity, and one day when an old lady refused to allow him to eat her lunch, the buck drew off and bowled the lady over. This seemed to open up a new field of pleasure to the deer (and women particularly appeared to be the object of his enmity), which at last became so pronounced that the animal had to be placed in confinement. Nearly all animal life is protected at this island. I have counted half a hundred bald eagles in an eleven-mile run; have seen them take a large fish from the water within easy gunshot, and they build their nests on pinnacles that are not difficult of approach. The sea birds are equally tame. Gulls gather in flocks a few feet from those who feed them; in the winter flocks of cormorants swim into the bays and are so tame that they merely divide when a boat passes, and fishermen often find that the cormorants take off bait almost as fast as they can put it on. Gulls dash at bait, and I have seen a long-winged, petrel-like bird follow my line under water at a cast, using its wings to fly along, and take the bait; and at times scores of sea birds are seen inshore feeding upon small shrimps, paying no attention to observers photographing them.

The most remarkable illustration of tameness to be seen here is that of the sea-lions, the story of which is so graphically told in the accompanying photograph. For ages the animals have held possession of a mass of rock on the shore of the island. A few years ago many were killed by vandals, but laws were passed and for a number of years the sea-lions have been protected and the rookery has increased in size until a split has recently occurred and another settlement

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WILD SEA-LIONS COMING OUT UPON THE BEACH TO BE FED AT AVALON, CAL.

(Continued on page 8.)

WELLMAN'S AIRSHIP FOR HIS NORTH POLAR EXPEDITION.

BY THE PARIS CORRESPONDENT OF THE SCIENTIFIC AMERICAN.

The airship in which Walter Wellman, accompanied by three other men, expects to make a dash for the North Pole from Tromsoe, Norway, next month, has been designed and constructed with very great care by Louis Godard at his aeronautic establishment near Paris. The balloon itself is a remarkable piece of work, aside from the fact that it ranks among the largest airship balloons that have ever been built. The most casual observer will notice its substantial construction, and it seems likely to weather the severest shocks which it may receive in the voyage toward the Pole. No less than seven thicknesses have been used by M. Godard in making the canvas. The principal novelty lies in the use of layers of pure Para rubber, which are placed between the layers of silk and cotton canvas. This is the first time that a light, as well as a strong, envelope has been secured in this way. Starting from the inside, we have first a layer of strong and specially woven French silk fabric; then on the silk is applied a layer of rubber, and on top of this comes a layer of cotton canvas. A thinner layer of rubber comes next, and then a second layer of cotton. Over this and forming the outer coating of the balloon is a thin layer of rubber. Such a combination of layers is very resistant, both to the pressure of the gas and to the moisture, which is one of the well-known features to be met with in the Polar regions. Seeing that the rubber is attacked by the atmosphere, it is not a usual thing to place it on the outside of the balloon; but in the present case it has been used for a number of reasons, the principal ones being that the airship will be in use but a comparatively short time, and that it was desired to have a smooth surface and especially to avoid the penetration of moisture into the tissues of the balloon, which would weight it down.

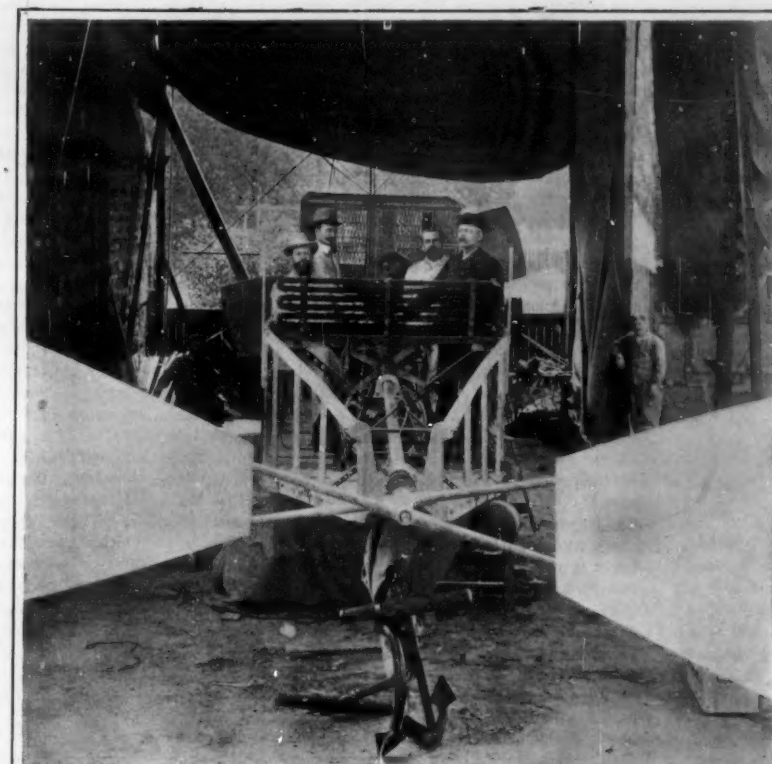
What is striking about the whole construction is the practical ideas which prevail in the design of all the parts. Thus instead of using a long cigar-shaped body, M. Godard preferred to shorten up the balloon considerably, and give a length which is only three times the largest diameter, so as to make it quite steady and easy to handle in the filling operations as well as in the actual flight. Thus we have a balloon whose total length is 160 feet and greatest diameter 52 feet. The large diameter lies near the front and in the proportion of 2 to 5. The cubic volume is 8,200 cubic yards, and the total surface of the balloon 2,400 square yards. A long guide-rope will trail upon the ice so as to steady the airship's flight. For these different reasons it will be seen that the chances of accident are very much lessened.

The car (body part) of the new airship, while it is built along the general lines which have now become familiar, has many new points when we come to examine it in detail. Credit must be given to the well-known engineer, H. André, for much of its design. Suspended below the balloon body by steel piano wires, the nacelle, which measures about 50 feet long by 6 feet wide and 4 feet high in the middle part, is tapered out at both ends, with the longer taper in front and the shorter toward the back. A slight change has been made over the first design of the nacelle, and it now tapers down both on the top and bottom of the frame, ending in a portion about 18 inches square which is formed of an aluminium frame containing the propeller-shaft bearing. At each end of the nacelle is a propeller driven by a separate motor. At the rear of the middle platform is situated the main cabin for the aeronauts, which is formed of basket work. In front of it is the 25-horse-power motor for the rear propeller, while still further forward is the main motor for the front propeller. The space lying around and between the two motors forms the main platform or deck of the airship, and here will be stationed the aeronaut Hervieu, whose long experience led him to be chosen as second in command, along with the machinist Colardeau. Inside the cabin Mr. Wellman and Major Hersey will have their quarters.

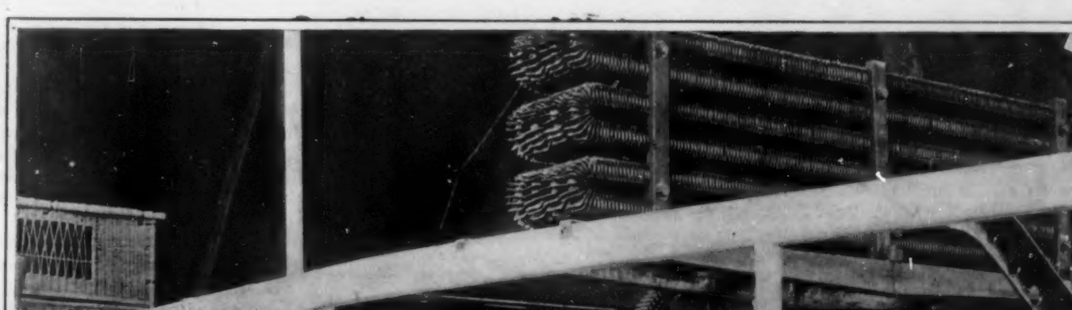
The main beams of the nacelle, which run from end to end, are formed of timbers of rectangular section reinforced by an angle piece in aluminium, which is placed on the outside and nearly covers the beam. The upper and lower beams are joined by a series of light wood braces placed vertically and spaced about 5 feet apart. At the middle part the height of the frame is about 4 feet. A set of wood braces run across between the two lower beams and serve to support the flooring, which is a continuous platform running from one end of the nacelle to the other, so that it is easy to circulate upon it. The main cabin, made of osier, is somewhat above a man's height and covers the whole width of the nacelle, having almost a cubical form. On either side are six windows of a light basket work, and other windows are made in the front and rear of the cabin. A complete set of wireless telegraphy apparatus is to be installed in the cabin. The mast wire is formed by the steel guide-rope cable which trails upon the ice. Thus the party will be able to keep up a constant communication with the base of operations at Spitsbergen and from there with Hammerfest, so that if all goes well we will constantly have news of the expedition.

The question of providing the motive power which is to propel the great airship has been solved in the most practical manner by the use of two gasoline motors and two separate propellers, so that if anything should happen to the principal motor, the second one will be sufficient to run the airship by means of the smaller propeller. Toward the front part of the main platform is mounted the 60-horse-power motor of the automobile type, constructed by the well-known Clement firm, of Paris. This motor will be observed in the foreground of our illustration, together with the gearing which connects it with the main shaft of the larger propeller. Above the motor is placed a set of radiating coils consisting of 24 flanged tubes. The radiator has piping which runs to both of the motors. As regards the Clement motor, it is of the most recent design and has four vertical cast-steel cylinders mounted on an aluminium crank-case. Both the inlet and exhaust valves are cam-operated. On the front side is a water pump and on the rear a magneto, both geared to the main shaft.

The second gasoline motor, which is placed near the cabin, is of smaller size, being but 25 horse-power. It was furnished by the Turgan Company, of Paris, and has two separate cylinders. The magneto and water pump are both located at the rear. Single-reduction gearing is used to connect each of the motors to their respective propeller shafts, each motor being used exclusively for its own propeller. The pinion is mounted outside the flywheel of the motor and upon a triangular frame made of steel tubes is supported an outer ball-bearing for the motor shaft. At the top of the frame is a second ball-bearing for supporting the main shaft of the large propeller, which is about three inches in



Front End of the Airship Body. The Man in Black is Walter Wellman.



Center of Body, Showing Cabin on the Left, the Two Motors and Radiator, and the Gears Which Drive the Forward Propeller Shaft.

THE BODY PART OF WELLMAN'S AIRSHIP FOR HIS NORTH POLAR EXPEDITION

diameter. On one end of the latter shaft is placed the large gear wheel which meshes with the pinion. The front propeller works at the rate of 260 R. P. M., while the smaller one runs at 280 revolutions. By running both propellers at the same time we obtain a total of 85 horse-power for the airship. As it is not desired to travel faster than about 15 miles an hour the large propeller alone will generally suffice. With both motors the speed will be 20 miles an hour. Steel-tube framing covered with stout canvas is used for both propellers. The diameters are 18 and 15 feet respectively.

Next to the rear motor is mounted a small five-horsepower motor of the Werner two-cylinder motocycle type. It is used for driving the air blower which fills out the inside air-bag, or balonette, contained in the balloon.

At the rear end of the balloon is a vertical rudder, and a horizontal frame runs under the balloon for some distance in order to steady it. On the nacelle is placed a 20-gallon gasoline tank of flat form and a 10-gallon water tank. The main gasoline supply is carried in a set of long cylinders. Under the nacelle will be hung a large, flat basket or car which will hold all the supplies and provisions. One of the features is an automobile sled which contains provisions for 75 days, and is designed to run on the ice by means of a cylindrical roller provided with points.

By the time this article appears, the material will have already been packed up and sent to Spitzbergen, and Mr. Wellman, along with his aids, will have arrived on the spot, where Major Hersey has been erecting a great balloon shed along with annex buildings, a meteorological station, and a hydrogen plant.

THE TAMENESS OF WILD ANIMALS.

(*Continued from page 6.*)

has been established half way up the island. It has been the custom for years for fishermen in cleaning their fish to toss the refuse into the bay, and the sea-lions formed the habit of coming down to the bay at this time to dine thereupon. At first only one or two came; now a band of two large bulls and several females make their headquarters at the bay, or spend most of the time there, constituting a valuable sanitary corps, as they eat every fragment of fish, the gulls joining in the feast. When not feeding, the sea-lions pass the time lying within a few feet of the beach, sleeping or playing, the females and young leaping from the water and going through various tricks of interest to the looker-on.

But a few feet away from the sea-lions are the boat-stands of the fishermen and boatmen, and boats are moving out and over the sea-lions constantly; yet they are apparently oblivious to the men, who never molest them. This has had a peculiar result. The enormous animals have become so tame that they almost allow the men to touch them, and readily come out upon the shore to feed from their hands. It so happened that I was upon the sands when no sea-lions were in sight, and upon asking a boatman where they were, he began to whistle, as though calling for a dog, and to call, "Here, Ben!" repeating the call several times, whereupon out from among the anchored boats appeared not only Ben, but two large bull sea-lions, which must have weighed half a ton, followed by two or three smaller females. The boatman tossed some pieces of albacore into the water, which the sea-lions dashed for, and down upon their heads plunged several score of gulls, paying not the slightest attention to the huge animals cavorting about. The sea-lions seized the dead fish under water, brought it to the surface and with a violent swing back and forth, tore the fish in pieces, the birds taking the debris, while several large pelicans floated in the immediate vicinity ready to pounce upon any fragment that came their way. Not ten feet from this interesting scene floated several boats containing spectators, yet the wild animals paid no attention to them, affording a remarkable illustration of the tameness of animals when protected. When this fish was disposed of the boatman took a large albacore by the tail and walked down the beach, calling the sea-lion by name. The animal responded at once, coming inshore with a rush, followed by two others. The boatman gradually retreated up the beach, the huge animals following, in their clumsy waddle, resembling gigantic slugs more than anything else, finally taking the fish from the man's hands. The scene was so remarkable, the confidence in the man so complete, that I requested a local photographer, Charles Ironmonger, to photograph the group, and the accompanying illustration is the result, showing a dramatic situation that occurs daily at Avalon Bay on the main street of the little town, affording a free show to visitors and sojourners on the island. The rookery where the animals make their headquarters is about two miles distant, and the sea-lions are so tame here that they can be approached with ease, and are the constant objects of amateur photographers who visit the locality in yachts and boats of various kinds.

THE PETERBOROUGH LIFT-LOCK OF THE TRENT VALLEY CANAL.

For many years great interest, particularly in Canada, has attended the construction of the Trent Valley canal project, to join Georgian Bay with Lake Ontario by means of a waterway, partly artificial, partly using natural watercourses, across the Province of Ontario. By means of this canal the long detour through Lakes Huron, St. Claire, and Erie is avoided, and the distance from the upper lakes to the eastern end of Lake Ontario is shortened by about 250 miles. In the total distance of 203 miles there are only about 20 miles of actual canal, the remaining portion of the waterway being through lakes and river stretches rendered navigable by dredging or by building dams. It is intended that the waterway shall have an ultimate depth of 8 feet, though at present the depth is but 6 feet. The configuration of the territory through which the waterway runs necessitates thirteen locks of the ordinary type, 134 feet by 33 feet, and three hydraulic lifts. Two of the latter are as yet but partially completed, though the third, near the town of Peterborough, has recently been opened to traffic. The construction of the Peterborough lift is of interest for various reasons; primarily, because it is the largest structure of this character in existence, and because concrete has been almost exclusively used in building it.

All the more recent structures on the Trent Valley are of concrete, and this material has been used wherever possible, in high-level bridges, swinging bridges, dams, culverts, and locks. The waterway is a barge canal, and when the 8-foot depth has been reached vessels of 800 tons burden may be used. The time for a tow to reach Montreal from Georgian Bay is estimated at six and a half days, employing steam barges as tow-boats as well as freight carriers. The entire cost of the canal when completed will be under $10,000,000.

The hydraulic lift-lock at Peterborough is on a four-mile section of the canal, and overcomes an elevation of 65 feet in a distance of 800 feet. The hydraulic lift-lock is theoretically automatic in principle, and is of great value where considerable differences of elevation are found in comparatively short distances, or where water available for canal use is scarce. The lift is operated on the principle that as a loaded vessel descends in one chamber of the lock, an empty one ascends in the other chamber, an additional volume of water in the lifted chamber being raised to the upper reach as the difference between the weights. A novel feature of value in the lift-lock is that it is double, permitting two vessels to be locked up and down respectively at the same time.

The Peterborough lock, as in other similar structures, consists essentially of a pair of watertight steel boxes, or chambers, carried by heavy trusses which are supported by two rams, each of which works in a steel press under each chamber. In the present instance the rams are 7 feet 6 inches in diameter, and the presses are connected by a 12-inch pipe, provided with a regulating valve governing the flow of water from one press to the other. The chambers are provided with swinging doors at each end, hinged at the lower edge and swinging outwardly, to permit the ingress or egress of the vessels raised or lowered. The gate construction of the Peterborough lock is a departure from the usual form of sliding gate heretofore employed, and is said to be a distinct improvement over the older form. By means of the lift-lock the operation is materially shortened, as it takes but three minutes to raise or lower the lock chambers, and from twelve to fifteen minutes to pass one or two vessels through the lock. As a further precaution, a hydraulically-operated gate is placed on the upstream of the lock.

The lock is built upon a mixture of hard clay, stone, and bowlders overlying a limestone rock, which forms the foundation for the substructure, built wholly of concrete. This substructure includes the main or breast wall, the wings, the side walls, and three towers, as well as the walls which terminate the lower reach. The main wall serves as a retaining wall for the upper reach, while the wings serve to hold the side embankments. The structure has been carried out in pleasing architectural effect by means of moldings and pilasters formed in the concrete.

The towers are approximately 100 feet high from the rock, and some 30 x 40 feet at the base. These towers contain the guides for the chambers, and the central one has, on its top, the cabin from which the lock operator controls the mechanism. The main wall is 126 feet long at the base, 80 feet in height, and 40 feet thick. It is pierced by a roadway, and thereby obviates the necessity of a swinging bridge. In the main wall, too, is a chamber in which the turbines and pumps are installed. The chamber pits are kept dry by the side walls which, as mentioned above, form the retaining walls for the earth alongside the waterways. The pits under the chambers are separated by a 12-foot wall.

The lock chambers are of large size, having clear inside dimensions of 139 x 33 feet, with a height of 9 feet 10 inches. The trusses which carry the chambers are of the double cantilever style, while four plate girders 9 feet in depth bring the load directly on the top of the ram columns. Each chamber weighs 800 tons empty, and 1,700 tons when filled with water. The pressure on the rams is nearly 600 pounds to the square inch. The rams are hollow and of cast iron, about 3¾ inches thick. The presses in which the rams work are steel castings having an internal diameter of 92½ inches and 3½ inches thick, the space between the rams and the presses being 1¼ inches. Each press was tested to a pressure of 2,000 pounds to the square inch; and the stuffing box at the top, filled to a depth of 9 inches with braided hemp held in place by a steel gland, does not leak under a pressure of 1,200 pounds to the square inch. The press wells are 18 feet deep, 16 feet 6 inches in diameter, lined with concrete to a finished depth of 14 feet 2 inches. To take the heavy load at the bottom of the presses, estimated at 2,000 tons, large blocks of granite were employed as foundations.

The lock is operated by placing the lower chamber with its bottom level with the bottom of the canal, thus allowing it to contain an 8-foot depth of water, while the bottom of the upper chamber is 10 inches lower than the bottom of the canal above, and thus contains water to a depth of 8 feet 10 inches. This gives the upper chamber an approximate weight 100 tons greater than the lower one. When the vessel has entered the lower one, the gates are closed and the valve of the connecting pipe is opened. The extra weight in the upper chamber causes that chamber to descend, forcing the water from the press below it into the other press, and causing the other chamber to rise with the rams that bear it. The weights of each chamber will be the same, whether merely filled with water or bearing a vessel, for, as is well known, a floating body displaces exactly its own weight of the liquid.

It is, of course, necessary to form a watertight joint between the end of the chamber and the end of the reach of the canal, the distance between the two being a little less than 2 inches. The joint is accomplished by means of a rubber hose fastened to the face of the reach along the sides and bottom, which is inflated with compressed air. The tube is flat and lies along the frame of the gate, and requires little air pressure to make a tight joint. Large rubber strips are employed within the chambers to prevent water leakage along the rims, the edges of the gates being machined to true surfaces which press against the rubber strips.

Various devices, including pumps and an accumulator having a ram, are used to remove casual water in the lock chambers and to supply water losses arising from the operation of the lock. Certain of the pumps are operated by turbines working under a 65-foot head in a chamber in the substructure.

The Death of George J. Snelus.

George J. Snelus, the metallurgist, vice-president of the Iron and Steel Institute, died on June 20 at the age of 69 at his residence, Ennerdale Hall, Fritzington, Cumberland.

The family of George James Snelus was impoverished when he was but seven years old, but the mother succeeded in giving the boy a good education and he was trained for a teacher at St. John's College, Battersea. After teaching several years he studied sciences at Queen's College, Manchester, and the Royal School of Mines, for which he gained a free scholarship. At the latter he had a brilliant career, carrying off medals and scholarships, and upon graduation securing appointment as chief chemist at the Dowlais Works, a post he filled for four years and a half. In 1871 he was made a member of the scientific commission sent to the United States to investigate steel-making processes, and on his return to England he announced the discovery of a process which enabled the making of pure steel from impure iron in a Bessemer converter lined with basic materials. This discovery of the basic steel process gained him the gold medal of the Iron and Steel Institute in 1883 and revolutionized the steel-making industry, as phosphoric iron, theretofore useless in steel making, could be used. His processes are employed in all countries.

A large roundhouse, with locomotive drop-pits of novel design, and equipped with an overhead traveling crane, has been built in connection with two new yards of the Pennsylvania Railroad at East Altoona, Pa. The roundhouse is a complete circle 395 feet in diameter, with fifty-two stalls 90 feet deep, and is served by a turntable 100 feet in diameter. The main portion is 65 feet wide, with a 60-foot 12½-ton crane, while parallel with this is a lean-to span in which the smoke outlets are placed. There are four drop-pits, one large enough to take all driving wheels at once, two for single pairs of driving wheels, and one for truck wheels. The table of each pit is operated by vertical screws working in nuts revolved by worm-wheel gearing, the screws descending into iron pipe sunk below the floor of the pit.

Correspondence.

Flying Machines and Wind Resistance.

To the Editor of the Scientific American:

In a letter from Mr. George T. Tomlinson, published in your issue of June 9, under the title of "Flying Machines and Wind Resistance," I notice the following statement: "If an airship pitches more when running to the wind than when running away from it, it must be due to the fact (I do not know the authority) that the wind is in waves, still this should be felt just as well going with the wind."

According to the best information that I have seen on the subject, the observed pitching of airships and balloons is seldom very great. When pitching does occur, it must be due to the wind coming in puffs, as Mr. Tomlinson suggests. That such puffy winds are common is well known to all sailors. As the natural period of pitching for an airship is probably considerable, the puffs which would affect it most would not, unless of great intensity, be readily detected by an observer on an airship except by its pitching. They would not be felt directly as variations in the velocity of the ship through the air; hence Mr. Tomlinson's apparent uncertainty as to whether they really do occur.

The amount of pitching of any ship or floating body in a medium in which waves or "puffs" (as of wind) exist depends on its own natural period of vibration, rolling or pitching, which may be calculated from the dimensions of the body and the density of the medium. If the period of vibration and the interval between puffs are nearly the same, the pitching or rolling will be violent; if they differ considerably, it will be very slight. Hence anything which alters the interval between puffs as felt by the ship will affect its pitching. When an airship is running into the wind, the *effective* interval between puffs at the airship is: (Actual interval at a fixed point) ×

$$\frac{\text{(Velocity of wind)} - \text{(Velocity of ship)}}{\text{Velocity of wind}}$$

When an airship is running before the wind, the effective interval is: (Actual interval at a fixed point) ×

$$\frac{\text{(Velocity of wind)} + \text{(Velocity of ship)}}{\text{Velocity of wind}}$$

Hence, subtracting, we find that the difference between the effective interval running before the wind and that running into the wind is: (Actual interval at a fixed point) $\times \dfrac{2\text{(Velocity of ship)}}{\text{(Velocity of wind)}}$. (The velocity of wind and of the ship are those relative to a fixed point on the earth.) Obviously this difference may be considerable, and may, therefore, cause the ship to pitch most either when running into the wind or when running before the wind. As the interval between puffs is usually large compared with the period of pitching, the effective interval between puffs when the ship is running into the wind, being much less than that when the ship in running away from the wind, is most likely to coincide with the period of pitching of the ship, so then in general, airships pitch most when running into the wind. Similarly, most vessels pitch when running into a head sea, and captains are sometimes forced to alter their course in such circumstances in order to make repairs, get out anchors, or do other things which violent pitching renders difficult.

W. W. Ammen.

U. S. Patent Office, Washington, D. C., June 16, 1906.

The Magic Sphere and the Gravitational Sense Organ.

To the Editor of the Scientific American:

In the current issue of your valuable paper you publish an article by Dr. Alfred Gradenwitz, entitled "The Magic Sphere." The author prefaces his discussion of the sphere by some very pertinent observations in regard to the sense of the vertical in connection with the power of vision.

You have seen fit to affix exceptions in a subsequent note, in which you discredit the idea of any gravitational sense organ, and also disagree with the author in his deduction that diametrical walking would be difficult on a rotating floor of the kind described.

I am not a scientist nor a mathematician, but I nevertheless am decidedly of the opinion that the author is correct in both these matters. First, in regard to the gravity sense organ, I have long been of the opinion that such a thing existed. This was first called to my notice in the following way:

I noticed, when seated below in a small sail yacht, that every time the boat came about, I seemed to see the walls of the cabin in a state of rotation around me. I repeatedly watched the phenomenon, and tried in vain to ascribe it to the working of any known sense or senses. This set me to thinking, and I soon took up the matter of the sense of the vertical, with similar results. This sense of sudden change of direction is closely correlated with the sense of the vertical, or of gravity, for an organ sensible of gravity would quite likely be sensible of change of motion, or inertia. It will be observed that no sense of rotation exists, *per se*, but it is only during the state of change that it can be perceived, and then only when the change is rapid. Just as the plumb-bob will remain in its former position if its support is suddenly rotated, and thereby indicate the change of direction, just so the organ or whatever it may be to which we owe this sense, operates under similar conditions. It does not seem credible to me, at any rate, that the impression of what constitutes an upright position is derived from external ocular observations. I once stood on the outermost edge of the overhanging rock that tops the outward-leaning wall of Glacier Point, which rises nearly half a mile from the floor of the Yosemite. I noticed then that all ocular means for determining a vertical were lacking. When viewing the earth from a height, slopes are not perceptible, and hills of considerable size are not recognizable. Therefore, with all objects removed to such a great distance, there remained to a person standing on the end of this rock only the sense of the vertical derived from gravity, to keep in an upright position. Indeed, how does this sense remain even when the sight is destroyed? If a person is revolved, or other means are used to put him in that dizzy condition where it is difficult to stand erect without staggering, and then the light is suddenly extinguished, the person is sure to fall, i.e., if the subject is really sufficiently disturbed to lose all sense of the vertical. To my mind, this is a strong argument for the gravitational sense organ. This is put out of working order by the treatment to which the subject is subjected, and the eyes are all that remain to guide him. Under these conditions, he sees objects about him rocking like a ship at sea, and attempting to follow the motion, he staggers. If the light be extinguished, he has no guide, and he falls.

In regard to the second point, viz., that diametrical walking would be difficult on a parabolic floor in a state of rotation, it is only a matter of figures to prove this to be correct. Let us suppose that the magic sphere in question is rotating at the rate of 14 revolutions per minute. Now, suppose an occupant, standing some distance from the center, approaches the axis at the leisurely rate of three miles per hour. At this rate he will shorten the diameter of the circle he is making about the axis by 8.8 feet in one second. This occasions a change of velocity of 6.4499 feet in a second. This acceleration is positive when the occupant moves centrifugally, and minus when he moves centripetally. Now, this acceleration is approximately one-fifth gravity, which is (for convenience) 32 feet per second. Therefore, if the speed of rotation be increased, a point may be reached where the occupant, in order to approach the axis at the moderate rate of three miles per hour, will have to exert a force equal to his own weight. This point would be attained at 69½ revolutions to the minute. Under these conditions the occupant would be obliged to lean far to the side in the direction of the rotation when walking centrifugally, and opposite to the direction of rotation when walking centripetally.

If I am laboring under any delusion in forming these conclusions, I should thank you for setting me right. As I said near the outset, I am neither a scientist nor a mathematician. Benj. S. Dean.

Philadelphia, Pa., June 16, 1906.

Interesting Papers on Dynamic Flight.

Two interesting and valuable pamphlets on dynamic flight have just been published in this country. These are entitled "Resistance of Air and the Question of Flying" and "Flight Velocity." They are from the pen of Herr Arnold Samuelson, engineer, of Schwerin in Mecklenberg, Germany, and they give the results of his work, both experimental and speculative, in this line for the past thirty years. The first-mentioned pamphlet gives the author's experiments and theories, and in the second, which was written after he heard of Langley's experiments, he compares his own experiments with those of Prof. Langley, and points out wherein they agree and disagree. Samuelson disagrees with Langley in several important points, such as in claiming that the center of pressure of an aeroplane is always one-third of the way back from the front edge, no matter what the angle of incidence, and also that the pressure perpendicular to the plane is independent of the angle of inclination. He ends by stating that the aeroplane is not the proper form of dynamic flying machine after all, and by giving it as his opinion that the flapping wing idea is the only one that will succeed. He has constructed and experimented successfully with a model of this type, and he gives working drawings of it in the pamphlet on "Flight Velocity," besides stating his willingness to send gratis to anyone interested full directions for building a motor-propelled, man-carrying machine of this type. All of his aeroplane experiments were made with small models similar in form to Langley's, although very much smaller and propelled by elastic bands.

Automobile Notes.

With the running off of the Grand Prix race in France on June 26 and 27, the first great road race of the year was successfully completed. This race, which was substituted for the Bennett Cup race by the French constructors in order to allow a greater number of French cars to compete, was run on two successive days over a triangular course some 60 miles in length, the total distance being about 750 miles. Out of 32 starters but 16 finished the first day's race, and 11 the second. Szisz on a 105-horse-power lightweight Renault machine was the winner, his total time being 12 hours, 14 minutes, and 7 seconds, corresponding to an average speed of over 63 miles an hour. Nazzaro, on a 135-horse-power Italian Fiat, was second in 12:45:25; and Albert Clement, on a 125-horse-power Clement-Bayard machine, third in 12:49:46. Barillier, on a 105-horse-power Brazier, was fourth in 13 hours and 53 minutes, Lancia on a Fiat fifth in 14:22:11, and Heath, on a 130-horse-power Panhard, sixth in 14:47:45. Three Brazier machines formed the only team that finished, these gaining fourth, seventh, and ninth places respectively. Two 125-horse-power German Mercedes cars were the last to finish, the best time of the two being 16:18:42, made by Alex. Burton's machine. The success of the winner is said to be largely due to a new detachable rim, by means of which a punctured tire is removed complete with the rim and a new, fully-inflated tire is quickly slipped on. Szisz is said to have changed tires no less than nineteen times during the race, and to have been able to change a tire in four minutes instead of requiring fifteen or twenty.

The American Automobile Association's tour for the Glidden Trophy, which starts from Buffalo on July 12 and ends at Mt. Washington, N. H., on the 28th, is to be one of the simplest reliability runs that have ever been held in this country. The cars will be run on a schedule, and checkers will be located about 25 miles apart, for the purpose of keeping tab on the contestants. The latter will be given the time at which they must pass the checkers and arrive at the finish. One point will be deducted for every minute they are behind time, and two points for every minute they are ahead. An average speed of from 15 to 17 miles an hour will probably be required. All repairs, adjustments, filling of tanks, etc., must be made each morning after the car has been officially started, though an allowance of 10 or 15 minutes will doubtless be made for this. The winner of the trophy will be the car which loses the least number of points from being behind or ahead of time from any cause whatsoever. The route of the tour extends through one of the most picturesque sections of the United States and Canada. Three days will be consumed in making the run from Buffalo to Saratoga, with stops at Auburn and Utica. Sunday, July 22, will be spent in Saratoga. The next day's run will be to Elizabethtown, in the heart of the Adirondacks. July 19 will be spent in Montreal, July 22 and 23 in Quebec, and July 27 at the Rangeley Lakes in Maine. These days for resting and sight-seeing will no doubt be greatly appreciated by all who participate in the tour. Elaborate preparations have been made for the successful conducting of this event. Accommodations have been provided by the committee for the accommodation of 400 people at the different stopping points. In some places tents will be used, and at Three Rivers, in Canada, one of the St. Lawrence steamers will accommodate the tourists over night. One and a half tons of confetti will be used by the pilot car in marking the route. From present indications, about fifty cars will be entered. Most of these are four-cylinder touring cars of 24 horse-power or over. Although there was a protest at the idea of not admitting light cars to the contest, which resulted finally in the admission of the same, very few of the entrants have cars of this class.

The Current Supplement.

The current Supplement, No. 1592, opens with an excellent article by the English correspondent of the Scientific American, describing the difficult feat of transporting by rail the huge stern frame and brackets which now form part of the Cunarder "Lusitania." Excellent illustrations accompany his text. Dugald Clerk continues his illuminating exposition of internal combustion motors. The æsthetic versus the economical value of Niagara Falls is discussed. The grains used for breakfast foods are made the subject of a short but interesting article. Now that the law has been passed which renders it possible to make alcohol for industrial purposes tax free, we hope to publish, from time to time, exhaustive articles on the manufacture of industrial alcohol and the methods by which it is denaturized. The first of these articles appears in the Supplement, and is entitled "Alcohol from Sawdust." It describes very fully the results which have been obtained in Germany with an experimental plant producing alcohol in this way. Wellman's huge Polar airship is also described.

FROM THE TOBACCO LEAF TO THE CIGAR.

ALTHOUGH we are a nation of smokers, many will learn with a shock of surprise that the annual estimated expenditure in this country for cigars alone reaches the stupendous figure of $300,000,000. It must be admitted that an industry whose total revenue is written in nine figures possesses an interest which demands for every question affecting it the most thoughtful consideration.

The present article deals with the technical side of the cigar industry; and it will be shown that in the manufacture of this, as of many another familiar luxury of our modern life, there is involved a variety of delicate processes and a range of technical skill, far greater than the average citizen would suppose. Ask the man on the street if he knows how cigars are made, and he will probably tell you that he does, having frequently watched the process in some one or other of those shop-window exhibitions, which form a favorite method of advertising the stock of goods within. Yet it is a fact that if the cigar is being carefully and properly made, the man who rolls it is merely performing the last operation in a succession of carefully-considered and carried-out processes which, as in the case of the American Cigar Company, whose plant and methods are described in the present article, will extend over a period which must be measured by months and, in the case of some brands of cigars, even years of time. We have often pointed out in the columns of the Scientific American that, as far as the merely technical side of any industry is concerned, there are undoubted advantages to be gained from the combination of a large number of factories and industrial plants under a common management. We have often shown that not only does it become possible to introduce economies both in management and labor, but that the shop traditions and special methods of manufacture peculiar to each of the factories thus brought together enable the consolidated concern to produce an article embodying all the points of excellence, or as many as it may wish to incorporate, of these hitherto separated and opposed interests. As an immediate result, the consolidated interests are in a position not only to turn out a superior product, but to produce it at lower cost.

Although the methods by which the cigar leaves are rolled up into the cigar and covered with the wrapper are, except for the introduction of cigar-making machinery, the same to-day as they have been from time immemorial, there has been great progress made in the art of preparing the leaf for the cigar roller, and this is particularly true of the company whose plant forms the subject of the accompanying illustration. In fact, if they were asked to indicate where they had been enabled to make the greatest advance in the art of cigar manufacture, they would undoubtedly point to their large stemmeries, located chiefly in the moist southern climate, where new and elaborate methods have been introduced for subjecting the tobacco leaf to a thorough curing and blending process, intermediate between the curing at the leaf houses and the working up into the finished cigar. Broadly speaking, all cigars may be divided under three heads, according as they are imported cigars, domestic cigars, and little cigars. The term imported cigars is universally recognized as applying only to those which are made in Havana. As the strictest laws are enforced against the importation of tobacco to Cuba, it follows that all genuine Havana cigars are made of Cuban tobacco. For the birthplace of the cigar, we must go to Havana, Cuba, and for centuries the word Havana has stood for the highest quality. The Havana Tobacco Company controls 260,000 acres of the best tobacco lands in the Vuelta Abajo district, and they have twenty-five factories in Havana. Here Havana cigars are made in all grades, from the cigar which may be purchased on any stand at two for 25 cents up to the most expensive brands which, if bought at retail, would cost about $2 apiece. The high quality of the most expensive Havana cigar is due to the very careful selection of the tobacco—tobacco which is grown in limited quantities in specially-favored districts; secondly, to the perfect curing and blending of the leaf and to the high wages which are paid to the best cigar makers; and lastly, to the fact that in making the most expensive grades, these men are allowed to take all the time they consider necessary.

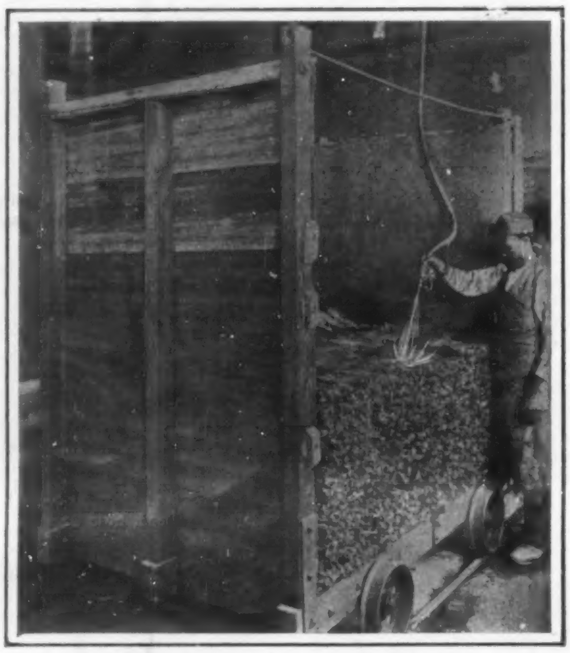


Fig. 1.—Tobacco is Unloaded from Cases in Which it Comes from the Leaf Houses, Placed on Trucks and Sprayed with Water Preparatory to Sweating.

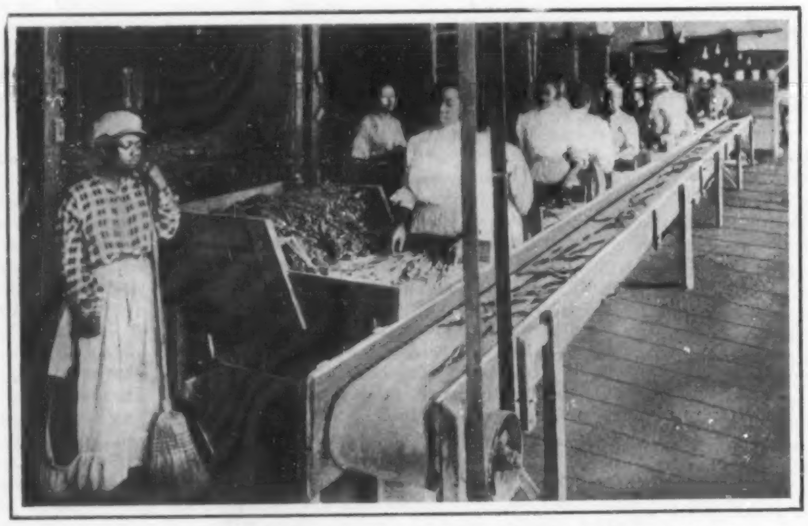


Fig. 2.—Selecting and Blending the Fillers. Poor Tobacco is Thrown Out; That of Good Quality is Placed on the Belt Conveyor.

Domestic cigars are made either from imported Havana tobacco, or from tobacco grown in this country, or from a combination of both. The domestic cigars, from the five-cent cigar upward, are made by hand in various factories of the American Cigar Company, to the number of twenty-five or more, which are scattered among the various cities of the United States. Quite a few cigars, below five cents in value, and all little cigars, cheroots, and most of the stogies manufactured by this company, are machine-made.

In the manufacture of all cigars, whether they are made by hand or by machine, whether they are made to sell for five cents or two dollars apiece, perfect sanitary cleanliness is maintained, because a better product is thereby obtained, and the factory conditions are rendered pleasanter for the operatives.

The Leaf Houses.—As soon as the tobacco crop has been gathered and stored in the barns, which is done in the fall of the year just before the coming of the frost, the company's agents select from their own farms, or purchase from the tobacco farmers, leaf tobacco suitable for various brands of cigars that are to be made. The tobacco for small cigars, cheroots, and all the cheaper brands is grown in the States of Wisconsin, Connecticut, New York, Pennsylvania, Ohio, and Florida. That for the more expensive brands is grown, as we have already noted, in Cuba, and the wrappers in Sumatra. The leaf tobacco as thus selected and purchased is delivered to the various leaf houses of the company. Here it is classified according to the brand for which it is to be used; is packed in cases, and shipped to large storage houses, where it is kept for twenty-four months and subjected to natural fermentation or sweating, the object of which is to sweeten and mellow the leaf, which otherwise would be strong and rank, and also to give it a uniform color.

At the time of purchase, the tobacco is classified according as it is to be used for wrappers, binders, or fillers. Contrary to the popular belief the wrapper has practically nothing whatever to do with the quality of the cigar, which is determined almost entirely by the filler. As a matter of fact, the filler constitutes about 94 per cent of the weight of the cigar, and it is questionable whether the average wrapper constitutes more than 2 per cent of its weight. Consequently, the color of the wrapper can have but little effect upon the strength of the cigar; for the mildest cigar may be covered by a dark wrapper, and *vice versa*.

The Stemmeries.—In the ordinary process of cigar manufacture, it is customary for the buyers to ship the leaf tobacco to the various factories, where two or three grades will be placed on the cigarmaker's bench; and in making up the filler he will select a certain number of leaves from each grade, and roll them together in the cigar, thus making what is called a blended cigar. The American Cigar Company, however, consider that it is only possible to get a perfect blending of several different grades of tobacco if, after they have been mixed together, they are subjected to a second and artificial sweating or fermentation, and it is largely due to the thoroughness with which this process is carried out in their stemmeries that they attribute the excellence of their output. The accompanying illustrations are taken at the company's large stemmery in Richmond, and the process as here illustrated and described may be taken as representative of their system.

Casing Room.—The tobacco is shipped from the leaf houses to the stemmeries in large cases, which are received in the casing room, opened, and inspected by the superintendent. The tobacco as it arrives is very dry and crisp, and if handled in this form is liable to break up and make a large amount of scrap. It is, therefore, opened out, bundle by bundle, and placed on large trucks where it is sprayed with water (Fig. 1) to make it pliable for handling. As the tobacco comes from the leaf houses, it will be of various qualities, and in loading it upon the trucks, the various qualities are taken, say from as many as eight different cases, so that each truck-load represents a blend of many varying grades. After being sprinkled on the trucks, it is taken to the sweat room, where it is kept at a temperature of 94 degrees and in a humidity of 95 per cent for a period of from two to four weeks. The trucks are then brought back to the casing department, where they are drawn up, six at a time, in front of what are known as the picking tables (Fig. 2). Here one man distributes the leaves from the trucks to the tables, where women untie the bundles, spread them out before them, pick out the inferior tobacco, which is used for a cheaper

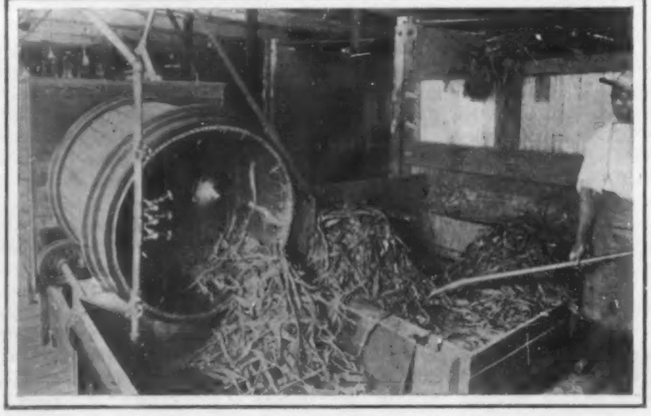


Fig. 3.—Spraying and Blending the Tobacco in the Mixing Cylinder.

FROM THE TOBACCO LEAF TO THE CIGAR.

Fig. 4.—Stemming the Leaf by Hand.

Fig. 5.—Stripping by Machinery. Operator Withdrawing Stripped and Booked Leaves.

Fig. 6.—Cutting Binders into Lengths to Suit Different-Sized Cigars.

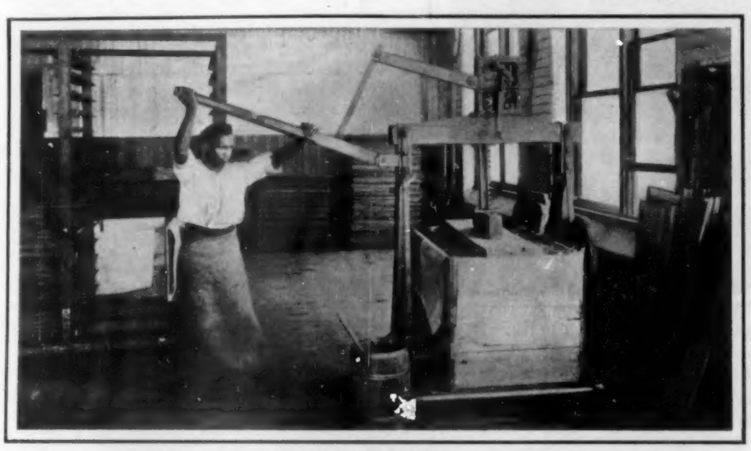


Fig. 7.—Packing Tobacco in Cases at the Stemmery for Shipment to Cigar Factories.

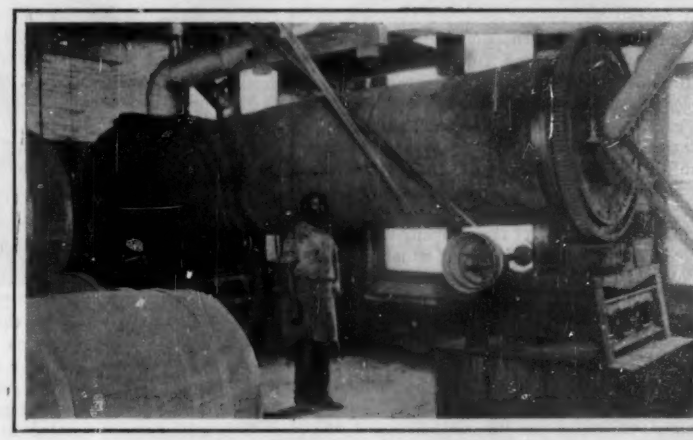


Fig. 8.—Rotating Cylinder in Which the Scrap Is Dried After It Has Been Cut to Suit Size of Little Cigar or Cheroot.

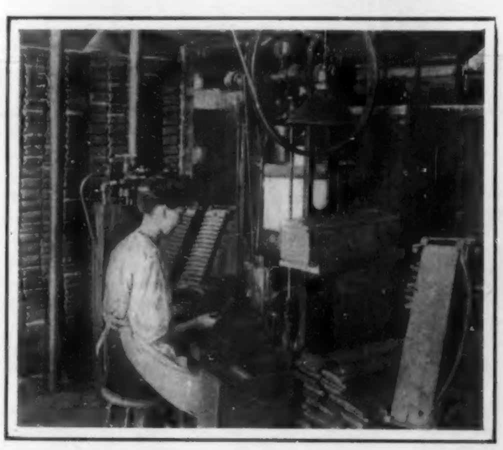


Fig. 9. Cheroot Bunch-Making. Girl Lays Binder on Rolling Apron, Filler Drops from Hopper Above.

Fig. 10.—Making Cheroots. Wrapper Being Transferred by Suction from the Die to the Cigar.

Fig. 11.—Pressing 5,000 Bunches for Cheroots in Molds at One Time in 30 Seconds.

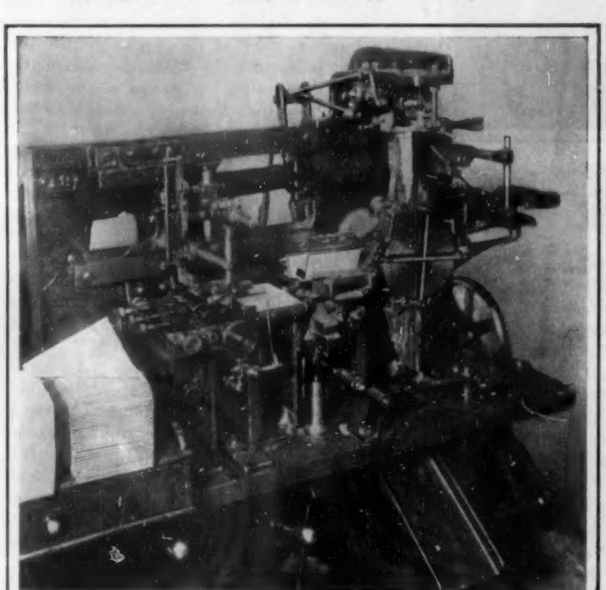


Fig. 12.—Automatic Machine for Making Cups in Which Cheroots Are Packed. Capacity, 75,000 per Day.

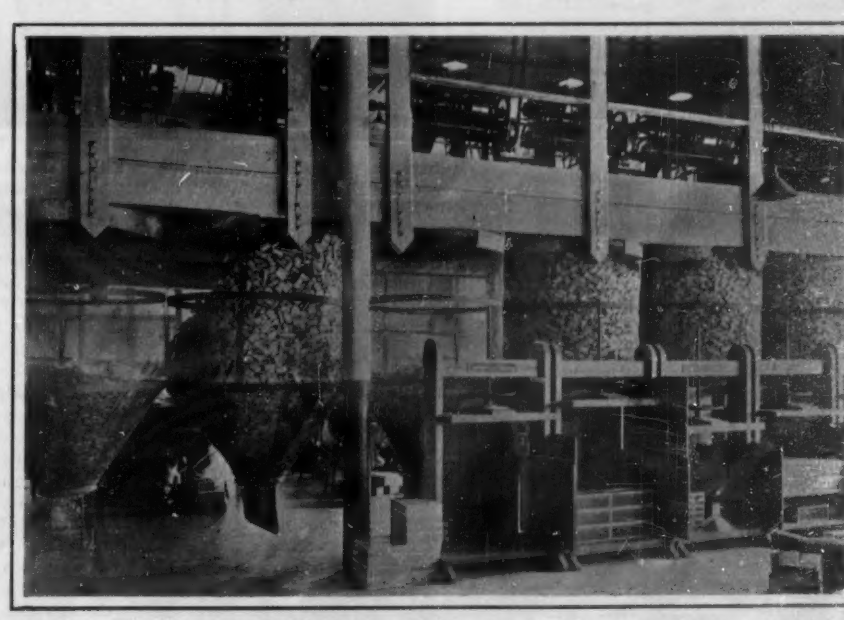


Fig. 13.—Wire Bins into Which the Cups Fall by Gravity from the Cup-Making Machines. Capacity, 75,000 Each.

FROM THE TOBACCO LEAF TO THE CIGAR.

grade of cigars, and throw the good tobacco onto an endless traveling belt or conveyor.

Casing Machine.—The selected tobacco thrown on the belt is deposited in a copper-lined rotating cylinder (Fig. 3), where it is rolled over and over and sprayed with fine jets of water, to give it the proper amount of moisture for fermentation. It is then pitchforked into a truck, where it is packed down tightly, and taken to the sweat room, where it undergoes fermentation until it has thrown off all the sap and rankness, and has reached the best smoking condition. It remains here for a period of from three to four weeks. When this process is complete the leaf tobacco, still on the truck, is brought up to the third floor again and undergoes another process of blending, sometimes as many as five different grades being mixed together. This blending takes place in a revolving screen cylinder where, in addition to the blending, sand, soil, and any other substance from the farm are removed, and the tobacco is thoroughly cleaned. It is then loaded onto the trucks again, where it stays packed for two or three days, the purpose being to secure a thorough exchange of aroma between the different grades of leaf, and to draw the leaves to a uniform condition for stemming.

It should be understood that the process of artificial fermentation has a double result, each of which is vitally important to the quality of the tobacco. In the first place, as seen above, it serves to sweat out the rankness, removing the sap and gummy substances; and secondly it serves to secure a thorough exchange of flavor of aroma from leaf to leaf, various leaves giving and taking from one another, and securing, so the experts of the company claim, a blend greatly superior to that which can be obtained when a cigar is made up of leaves that come direct from the leaf houses and have not been subjected to artificial fermentation.

Stemming Department.—The blended tobacco leaves are now wheeled on trucks to the stemming department, where the stems are removed. In stemming by hand, as shown in our illustration Fig. 4, the stem is torn from the leaf by the operator, who commences stripping from the tip, and by a deft movement strips it clear, leaving the leaf in two parts. In the illustration the stem is shown half torn away, the leaf being separated into two halves or strips, as they are called. The strips are neatly arranged, one above the other, in two piles, or "books," of fifty leaves each. The books of strips are taken from the stripping benches and placed on wire trays, 14 inches wide by 3 feet long. There are eight piles to the tray. The trays are loaded into the shelves of large trucks, ninety-six trays to the truck, and brought down to the drying department.

Drying Department.—In the drying department the strips are allowed to dry out naturally for a period of twenty-four hours. They are then placed in the dry room, where a current of warm air, at a temperature of 95 deg. to 100 deg. Fah., is driven through them until it has taken off all the surplus moisture, the process of drying occupying from four to five hours, according to the grade of tobacco. The trucks are then drawn out, and the tobacco allowed to cool out for twenty-four hours.

Ordering Room.—The process of drying out is liable to have left the outside leaves of the tobacco a little too dry for packing, and, therefore, the trucks with their load are taken out and placed in what is known as the ordering room, as shown in Fig. 15. Here the tobacco strips are subjected to a current of humid air at a temperature of from 92 to 95 degrees, for a period of from fifteen minutes to half an hour. The trucks are then wheeled out and the contents removed and packed in paper-lined cases (Fig. 7), after which the cases of tobacco are placed in storage for from three to five months, in order to allow the tobacco to make a further exchange of aroma. The product is then ready for shipment to the various cigar factories.

A most notable feature in this stemmery is its absolute cleanliness, the free circulation of fresh air, the absence of dust, and the clean personal appearance of the people who are employed. Another feature that will be appreciated by smokers is the fact that the tobacco leaf in the stemmeries rarely comes in contact with the hands of the workmen. Machinery takes the place of human hands wherever possible, and this of course aids in keeping the finished product free from anything objectionable.

The Old Virginia Branch.—One great advantage of the widely-extended operations of the American Cigar Company is that, making such a great variety of cigars, and of such widely different grades, it becomes possible not only to secure great economy by using up all of the tobacco in some one grade or other, but it also becomes possible to use these various grades of tobacco in the particular quality of cigar to which they legitimately belong. Moreover, the company claims that by virtue of this variety and these economies, it is able to put a higher quality of tobacco into a given grade than could be put in that grade by a manufacturer whose operations were carried out on a less extensive scale. Interesting proof of this is shown in what is known as the Old Virginia Branch, which is devoted to the manufacture of what are known as "scrap filler" cigars; that is, little cigars, the fillers of which are made of high-grade, short-length tobacco from the factories which make the higher grades of cigars by hand. This branch handles all by-products, such as wrapper and binder cuttings, and short pieces of tobacco too short for long-filler cigars. The material is brought to this factory from the various factories of the company in America, Cuba, and Porto Rico; and here it is cut up, hand-picked, thoroughly cleaned, sweated, and put through curing and blending processes analogous to those already described in the treatment of the stemmery.

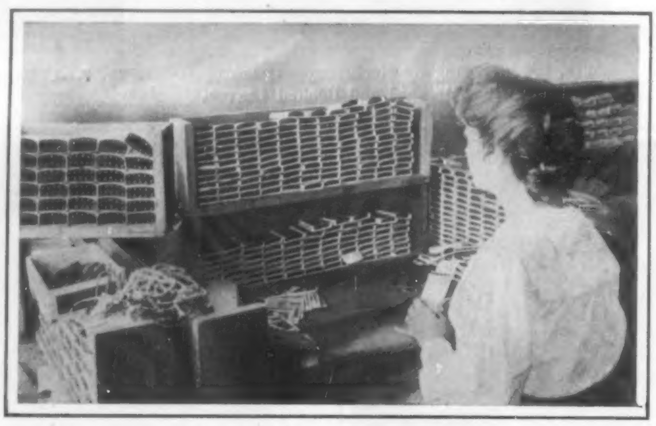


Fig. 14.—Sorting for Color and Packing Little Cigars.

The cases are opened, inspected, and graded. The tobacco is then sprinkled, allowed to stand for twenty-four hours, and then carefully picked over on tables to remove any foreign matter. It is then bulked in bins, and allowed to stand for twenty-four hours to draw it to a uniform condition. It next passes through a machine, where it is subjected to a further process of cleaning by means of an air blast, where all fine substances are blown away. Next it passes through a sieve, in which it is still further cleaned and graded as to size. It next passes down to a steam drier (Fig. 8), a large rotating cylinder in which the tobacco is thoroughly dried out. From the drier it falls down through chutes to another floor, and direct into hogsheads, in which it is pressed down and snugly packed under a 750-pound press, ready for shipment to the little-cigar factories.

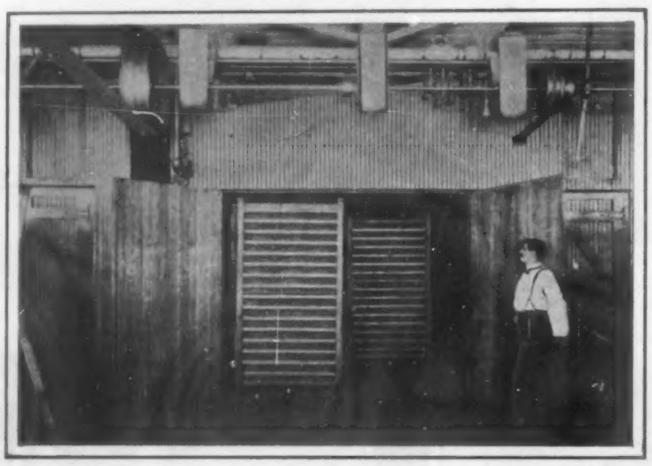


Fig. 15.—Ordering Room in Which Fillers After Being Stripped, Booked and Dried Are Again Put in Condition for Shipment to Factories.

FROM THE TOBACCO LEAF TO THE CIGAR.

Cigar-Making Machinery.—The illustrations of the manufacture of little cigars by machinery were taken at the Whitlock branch, which employs 1,750 hands, and is the largest single cigar factory in the world. It is chiefly occupied in the manufacture of Old Virginia cheroots and the Royal Bengals little cigar. As in the hand-made cigar the whole operation is performed by hand, so here it is done entirely by machines, which handle the tobacco and go through the operations of bunch-making and wrapping with more than human dexterity and accuracy. The total annual output of this one factory reaches the figure of 250,000,000 cigars and cheroots.

The raw material which is brought to this factory from the various farms and stemmeries, etc., of the company, consists of long fillers and short fillers (the latter consisting of the cut-up leaf as prepared in the Old Virginia plant) and of binders and wrappers which have already been sweated and blended in the stemmery. As the tobacco reaches the factory in a comparatively dry condition, it is taken from the cases, dipped in water, and set upon a casing board to drain. It is left in this condition over night to insure distribution of the mosture, and is then shaken out and taken to the stemming department, where nearly 200 stemming machines are employed, one of which is illustrated in Fig. 5. In this machine the stems are stripped from the leaf. It consists of a pair of rotating cylinders, of the same diameter and carried on the same shaft, which are so placed that their abutting inner ends leave just sufficient space for the stem of the tobacco leaf to pass through. Engaging and projecting through the abutting edges is a circular rotary knife, which, as the tobacco leaf is drawn over the cylinders, neatly cuts out the stem, the two halves of the leaf or "strips" being wound on the cylinder. The process is repeated until fifty leaves have been passed through the machine and neatly laid one above the other in two piles or "books," as they are called, of fifty leaves each. The stems drop into a box below, and are ultimately sold as fertilizer. Both the binders and wrappers are stripped by this method. The books of fifty binders are now cut up into suitable lengths for the particular size of cigar that is to be made.

Automatic Bunch Machine.—In making the "bunch" (the rough cigar, before the wrapper is rolled on) in the ingenious machine shown in our illustration (Fig. 9), the binders are carried in a box in front of the operator, and the filler (in this photograph consisting of the product of the Old Virginia branch) is loaded into the large circular hopper seen at the back of the machine. The girl spreads two pieces of binder on a horizontal rubber rolling belt, and the requisite amount of filler falls from the hopper and is pushed down into the binder by means of a rectangular plunger. Then the belt, by a swift movement, rolls the bunch, which is picked up by the girl and placed in a wooden mold, which is provided with pockets for twenty bunches.

The bunches are then loaded in their molds onto trucks, each of which carries 250 molds, or 5,000 bunches. The trucks are wheeled to a hydraulic press and subjected to a pressure of 1,500 pounds to the square inch, the whole time occupied in pressing this number being half a minute. The capacity of the bunching machine may be understood from the fact that these 5,000 cigars represent about one day's output of a single bunch-maker. The molds are now taken to a machine, which cuts off the long ends of the bunches, after which they are carried, still in the mold, to the automatic rolling floor.

Automatic Rolling Floor.—The most ingenious invention in this establishment is the machine for rolling the wrappers on the cigars, which is shown in Fig. 10. The wrapper is spread over a die and held down upon it by suction, acting through a large number of holes with which the die is perforated. A knife, formed in the peculiar cucumber-like shape of the wrapper, rises through the die, and a roller passes over the wrapper, pressing it on the knife and cutting out the desired piece. Then another arm or carrier, which is connected by a flexible air hose with the curved suction pipe, which is seen standing at the center of the machine, picks up the wrapper by air suction. As it does so, a loop of wire rises from a little pot of paste, and pastes the end of the wrapper. Meanwhile another arm has brought over a bunch and placed it within a nest of three rotating rollers, which open to receive it. Next a needle comes forward, disengages one end of the wrapper from the carrier, and holds it against the large end of the bunch until the latter has made a turn and a half. Then, as the traveling carrier sweeps across the roller nest with its contained bunch, the wrapper is transferred and rolled on the bunch. Next the arm which brought over the bunch picks up the finished cigar, and places it between two rotary knives which cut it to length. As each cigar is rolled, the bunches, which have been placed on a feeding chain, are moved forward by the space of one bunch; and each bunch is picked up by mechanical fingers, taken over to be wrapped, and returned to the chain, without any human handling whatever. Here again ma-

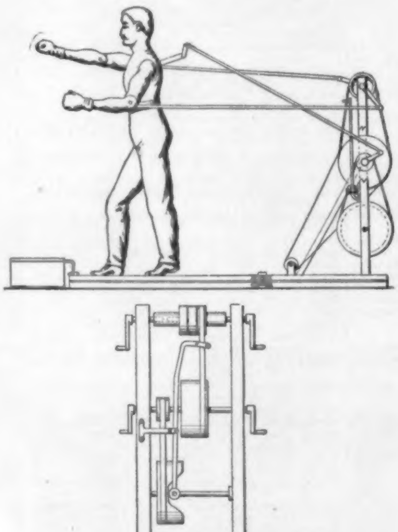
chinery performs even more perfect work than is possible by human hands, and absolute cleanliness of the finished product is insured.

HUMIDORS.—A marked feature in the manufacture of the product of this factory is the care that is taken to keep the cigars in the proper moist condition, which is done by storing them for a certain length of time in humidors. The humidor is a room of special construction, with brick floor and walls, in which the temperature and humidity are maintained at a desired degree. Cigars are liable to become too dry in the process of manufacture, hence, as soon as the wrapping has been done they are taken to the humidor, where they are drawn back to perfect packing conditions. From the humidor they are taken to the cigar packers, where they are carefully sorted according to color and packed in boxes of twenty-five, fifty, and one hundred. The packed boxes are placed in large presses, and left there over night. The next morning they are returned to the humidor, where they remain for a period of from three to six weeks, at the end of which time they are ready for shipment to the dealers.

A MECHANICAL PRIZEFIGHTER.

To accommodate the needs of the professional boxer, as well as to instruct the novice in the "noble art of self-defense," Mr. Charles Lindsey, of 58 Glen Street,

A MECHANICAL PRIZEFIGHTER.



THE MECHANISM OF THE SPARRING MACHINE.

New Britain, Conn., has invented an automatic sparring machine. This machine is really a formidable fighter, and has already gained quite an enviable reputation in the many encounters it has had with local talent. Not only does it deliver straight leads and counters, but it varies these with an occasional uppercut, and its blows are rained with a speed and power that are the envy of the professional boxer. The machine does not "telegraph," that is, it does not give a warning of a coming blow by a preliminary backward jerk, which is so common to all but the best of boxers. Nor can the opponent escape these blows by side-stepping, because the automaton will follow him from one side to the other. At each side of the opponent is a trapdoor, connected with the base of the machine in such a way that when he steps on one or other of these doors, the machine will swing around toward him. The arms of the mechanical boxer are fitted with spring plungers, which are connected with crank handles turned by machinery. Separate crankshafts are used for the right and left arms, and they carry pulleys between which an idle pulley is mounted. These pulleys are connected with the main driving pulley by a belt which is shifted from side to side, bringing first one and then the other of the boxing arms into action. The belt-shifter is operated by an irregular cam at the bottom of the machine, and this gives no inkling as to which fist is about to strike. Aside from this, the body of the boxer is arranged to swing backward or forward under the control of an irregular cam, so that the blows will land in different places on the opponent; for instance, a backward swing of the body will deliver an uppercut. The machine is driven by an electric motor, and can be made to rain blows as rapidly as the best boxer can receive them, or it may be operated slowly for the instruction of the novice. As the machine is fitted with spring arms and gloves, an agile opponent can ward off the blows and thus protect himself.

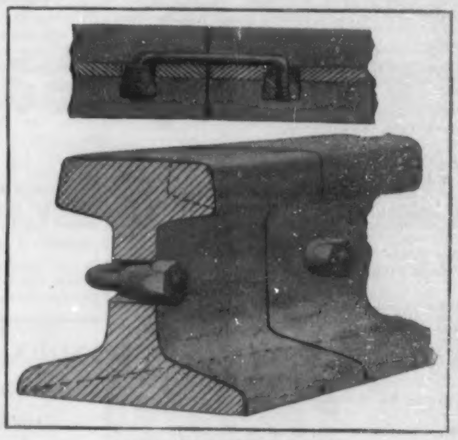
AN IMPROVED TURBINE.

Turbine engines of the Parsons type, in which the steam passes continuously through the engine in the general direction of the axis, are formed with a series of circumferential enlargements of both the shaft and the casing, in order to provide for the expansion of the steam. This construction offers the objection that each enlargement of the shaft or spindle presents a shoulder or abutment, on which the steam acts to produce a powerful end thrust. In order to balance this thrust, it is customary to provide the spindle with a series of thrust rings, against which the steam presses in the opposite direction. In the accompanying engraving we illustrate an improved form of turbine, in which the steam acts upon the center of the spindle out toward the opposite ends, so that the thrust of one half of the spindle will counterbalance that of the other. Furthermore, to allow for expansion of the steam, the cylinder is formed of two frustro-conical sections with their smaller ends connected. The shaft is of uniform diameter throughout, but beginning at the center the blades of each row are made longer than those of the preceding row, to correspond with the conical casing. Near the ends of the spindle, where the blades would be dangerously long if they extended all the way to the casing, a circular flange is used, which divides the blades into two concentric rings. Instead of feeding the steam from a single point through the entire series of blades, means are provided for admitting steam to each row of blades individually. It will be observed that the turbine is formed with two casings, namely, an outer one, *A*, and an inner one, *B*; reference has already been made to the latter as being formed of two frustro-conical sections. The space between the two casings forms a steam reservoir for a series of stationary inlet tubes, *D*, which project inward between the rows of blades on the spindle, *C*. These tubes are slotted at the forward side, and through these slots the steam is directed against the blades. Each tube is also provided with a wing extending rearwardly, and serving as a stationary blade to direct the steam from one row of movable blades to another. Thus, aside from receiving a fresh supply of steam from its own series of tubes, each row makes use of the steam passing through the preceding rows. The inner rows of blades are designated at *E* in the engraving, while the outer double-decked rows are indicated at *F*. The tubes which supply the rows *F* are short and feed steam mainly to the exterior blades of these rows, being practically cut off from the interior blades by a ring or circular bottom wall. Within the ring are a series of stationary blades, *G*, which serve to conduct the steam from the blades *E* to the interior blades, *F*. A patent on this improved turbine has been secured by Mr. George L. Mundigler, of West Allis, Wis.

A new process of manufacturing hollow tin soldiers so popular a toy with children has been successfully devised by an English firm. Hitherto this product has been practically a German monopoly, the soldiers being cast solid. By means of this new process, however, the toys are cast hollow, and are some sixty per cent lighter than the German article, while owing to the reduction in the amount of metal and the speed with which the work can be carried out, the articles can be produced much below the German figure. As a result of this discovery the German trade with England which has hitherto been of great proportions is rapidly declining, while the toys are of stronger construction owing to the utilization of a more stable metal.

IMPROVED RAIL BOND.

A patent has recently been secured by Edwin W. Robinson, of Punxsutawney, Penn., on an improved rail bond for electric railways. The new bond is arranged to insure an exceedingly firm electrical con-



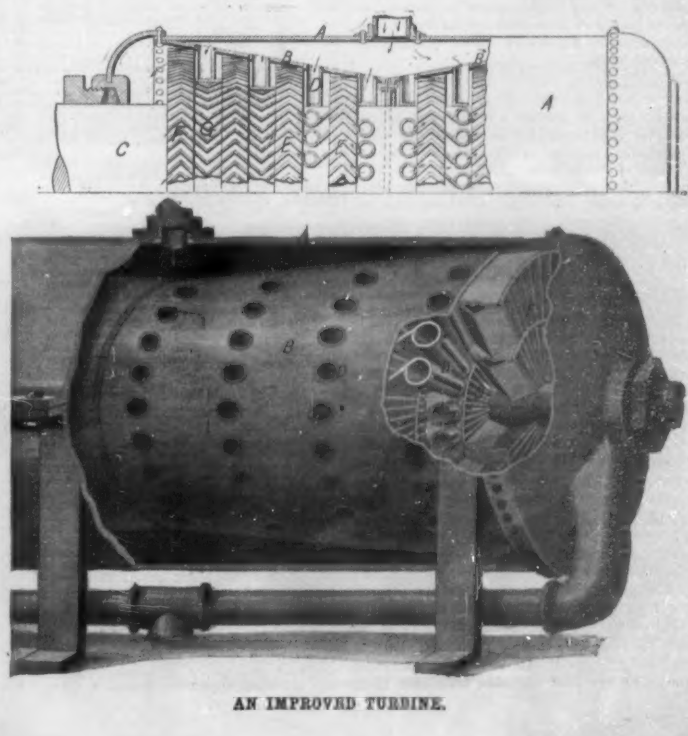
AN IMPROVED RAIL BOND.

nection between adjacent rails, and in a very simple and economical manner.

The invention will be clearly comprehended by a glance at the accompanying engraving. It comprises a conductor in the form of a rod, which is bent to enter holes in the webs of two adjacent rails. The ends of the rod are threaded to receive a pair of nuts, which enter the holes in the webs. The nuts are formed with frustro-conical ends, and as the nuts are screwed up on the rod, they not only draw the rod into close contact with the webs of the rails, but also wedge their frustro-conical ends tightly into the holes in the webs. This insures an exceedingly good electrical connection between the adjacent rails. It will be evident that the new rail bond can be applied to rails as now constructed.

Wanted: A History of Physics.

There are great histories of mathematics and great histories of astronomy, but no history of physics on a grand scale. Some serviceable manuals there are, as well as monographs on particular topics; what seems to be lacking is some comprehensive and comparative survey of the whole range. The history of any of the natural sciences, like the history of human activity, is not merely an encyclopædic record of past facts; it reveals both the spirit and the wealth which the past has bequeathed to the present, and which, in due course, the present will influence before transmission to the future. Perhaps all our physicists are too busy to spare the labor needed for the production of a comprehensive history; yet such a contribution to the subject would be of great value, not to physicists alone.



AN IMPROVED TURBINE.

Business and Personal Wants.

READ THIS COLUMN CAREFULLY.—You will find inquiries for certain classes of articles numbered in consecutive order. If you manufacture these goods write us at once and we will send you the name and address of the party desiring the information. **In every case it is necessary to give the number of the inquiry.**

MUNN & CO.

Marine Iron Works. Chicago. Catalogue free.

Inquiry No. 8194.—Wanted, machinery for making wooden toothpicks.

For mining engines. J. S. Mundy, Newark, N. J.

Inquiry No. 8195.—Wanted, electric welded wire hoops, galvanized gas pipe crosses large enough to receive ¾-inch pipe with one end cast heavy enough to turn a ball race around the opening to receive the gas pipe and large enough to retain 5-16-inch ball, also steel plate 3 10 inch thick.

"U. S." Metal Polish. Indianapolis. Samples free.

Inquiry No. 8196.—Wanted, manufacturers of chest handles, hinges for washing machine, also gas pipe.

Handle & Spoke Mchy. Ober Mfg. Co., 10 Bell St., Chagrin Falls, O.

Inquiry No. 8197.—For manufacturers or dealers in wire for making ornamental novelty.

I sell patents. To buy, or having one to sell, write Chas. A. Scott, 719 Mutual Life Building, Buffalo, N. Y.

Inquiry No. 8198.—Wanted, manufacturers of charcoal burners, for making charcoal out of refuse wood; also for makers of stump pullers.

FOR SALE.—Water front in New York harbor with upland and riparian right. Address X. Y. Z., Box 773, New York.

Inquiry No. 8199.—Wanted, the manufacturer or dealer in the patented device for recording notes of music.

The celebrated "Hornsby-Akroyd" Patent Safety Oil Engine is built by the De La Vergne Machine Company. Foot of East 138th Street, New York.

Inquiry No. 8200.—For manufacturers of "knuckle-joints" or device used in a similar manner.

Manufacturers of patent articles, dies, metal stamping, screw machine work, hardware specialties, machinery tools, and wood fiber products. Quadriga Manufacturing Company, 18 South Canal St., Chicago.

Inquiry No. 8201.—Wanted, manufacturers of centrifugal gas-cleaning apparatus, of the Edward Theisen type, such as used in Europe.

Automobile experts are in constant demand at high salaries. Our seven weeks' course is the most thorough and practical, fitting men to drive, handle and repair Day and evening classes. Special course for owners New York School of Automobile Engineers, 146 West 56th Street, New York.

Inquiry No. 8202.—Wanted, dealers in pearl-bearing mussels, also in asbestos.

Inquiry No. 8203.—Wanted, makers of "hollow wire" such as used for heating and ventilating systems.

Inquiry No. 8204.—Wanted, names of manufacturers of soda fountain globes.

Inquiry No. 8205.—Wanted, manufacturers of filling machines for beer.

Inquiry No. 8206.—Wanted, manufacturers of cash registers.

Inquiry No. 8207.—Wanted, manufacturers of fancy bands and moulding of britannia metal.

RECENTLY PATENTED INVENTIONS.

Of General Interest.

HEADWEAR.—J. U. ADAMS, New Orleans, La. This invention has reference more especially to hats, caps, and the like of the types embodying a sweat-band; and one of the principal objects is to provide the sweat-band of the article with means for enabling the same to be loosened (expanded) or tightened (contracted) within certain limits to thereby adapt the article to fit the head of the wearer thereof.

PAPER-LIFTING DEVICE FOR PAPER-ROLLS.—E. S. BROWN, Washington, D. C. The parts are so arranged that the device may be readily secured to any of the ordinary frames now in common use, it being preferred to place the bracket with its stop or lug against the front edge of the top bar of the frame and to secure the said bracket by screws passing through it top plate. This facilitates the application of the improvement to devices already in use and also enables its ready connection with the frames in course of manufacture the same.

DOOR CHECK AND CLOSER.—G. T. SHEETS, Salt Lake City, Utah. The object in this instance is to provide a device with special means for regulating the action of the dashpot and for facilitating the disconnection of the device from the door. Arrangement is made for regulating the tension of the spring which is used in connection with the closer and for attaching the device for operation with or without the dash-pot.

Household Utilities.

FURNITURE.—G. H. ABERCROMBIE, Poughkeepsie, N. Y. The invention relates particularly to combined screens and washstands, the object being to provide a device particularly adapted for use in small rooms or where furniture-space is limited, the device being so constructed that the shelving and other parts will fold closely against the screen convenient for storage or placing closely against a wall.

COOKING UTENSIL.—R. A. W. KRAMPITZ, Valdez, Alaska. In this invention the improvement is in culinary utensils especially designed for use in camping-outfits and the like, but which may be employed whenever desired. The utensil comprises three different camp utensils—one a mixing-pan for mixing bread, etc., a bread-pan in which biscuits and other bread may be baked, and a frying-pan which may co-operate with the mixing-pan and bread-pan.

VENTILATOR.—H. L. MORRILL, Monticello, Maine. In practical use this ventilator is inserted in the corner of a window-pane, a triangular section of glass being removed for reception thereof. The edge of the glass rests against the flange and is maintained in contact therewith by means of the cover on the opposite side. By manipulating the latch on the cover the same may be adjusted to give any desired degree of opening, or the opening may be entirely closed.

Machines and Mechanical Devices.

PRINTING MECHANISM FOR WARP-PRINTING DEVICES.—F. SCHMIDT, 7 Edisonstrasse, Oberschöneweide, near Berlin, Germany. Besides the advantage of using thin liquid color this apparatus offers many others. Printing can be done much quicker than with the old apparatus as lifts or throws are very light. As when printing the drum can make no lateral movements, printing-strips become sharply defined. Much time is saved, engagement being effected by simple movement of a lever. As the color-boxes may be situated on the endless chain below the printing device—the warp-printing drum—and do not require to change position, they do not stop the work and cannot be so easily mistaken one for the other as formerly. Fewer assistants are required for this new apparatus.

NOTE.—Copies of any of these patents will be furnished by Munn & Co. for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

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Explosion engine, H. D. Dibble 824,528
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Fabrics, former for tubular, C. C. Shepard 824,212
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Faucet, fluid measuring, G. K. Cooke 824,095
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Remedy, making an internal, R. Griese 824,539
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Stethoscope, T. W. Tallqvist 824,450
Stone making mold, artificial, N. L. Damon 824,235
Stopper and liquid dropper, combination, J. L. Dunnock 824,631
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Talking machine with rotatable horn, F. & W. Lochmann 824,368
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Teeth, metallic support for artificial, D. N. Booth 824,465
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Vehicle, milk and cream, C. E. Austin 824,399
Vehicle storm front, C. M. Stone 824,515
Vehicle, wheel, W. E. Greer 824,241
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Washing machine, C. Dietz 824,529
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Water and feed trough for fowls, M. C. Rogers 824,508
Water level indicator, J. T. Dawes 824,098
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Analgesics, El Zernac Co. 54,615
Antiseptic compound, Hylin & Co. Fabriks Aktiebolag 54,332
Antiseptics and washes for the mouth and teeth, F. A. Schulz 54,583
Automobile vehicles, Reo Car Co. 54,722
Automobiles, Hol-Tan Co 54,281
Automobiles, St. Louis Motor Carriage Co.. 54,758
Baking powder, Howell Mfg. Co. 54,552
Beer, Curran and Joyce Co. 54,594
Beer, Hoster-Columbus Associated Breweries Co. 54,602, 54,603
Beer, Minneapolis Brewing Co. 54,642, 54,643
Beer, lager, Peter Schoenhofen Brewing Co. 54,644
Beer, root beer extract, and dry ingredients for making root beer, root, Charles E. Hires Co. 54,465
Belting, leather, Republic Belting & Supply Co. 54,581
Bicycles, tricycles, velocipedes, and parts thereof, Hibbard, Spencer, Bartlett & Co. 54,247
Biscuits, crackers, and cakes, Crescent Macaroni & Cracker Co. 54,545
Biscuits, crackers, and cakes, A. J. Medlar Co. 54,634
Bitters, peach, H. Klas 54,605
Boilers for heating purposes, Kellogg-Mackay-Cameron Co. 54,714
Books for railway employees, educational, Railway Educational Association 54,251
Boots and shoes and leather used in their manufacture, leather, Rice & Hutchins 54,526
Boots and shoes, leather, Lynchburg Shoe Co. 54,285
Boots and shoes, leather, William Eastwood and Son Co. 54,369
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Boots and shoes, leather, White-Dunham Shoe Co. 54,728
Boots and shoes, men's, women's, and children's leather, Thomas G. Plant Co. 54,315
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Candy, Pepper Co. 54,522
Candy, Reymer & Brothers 54,524
Canned corn, Burnham & Morrill Co. 54,372
Canned corn and sauerkraut, P. Hohenadel, Jr. 54,513, 54,514
Canned corn and succotash, Saco Valley Canning Co. 54,436
Canned fruits, California Canneries Co. 54,402
Canned fruits and vegetables, Sprague, Warner & Co. 54,394
Canned fruits and vegetables, Wayne County Preserving Co. 54,399
Canned fruits and vegetables, Abbott Grocery Co. 54,400
Canned fruits and vegetables, Booth Packing Co. 54,410
Canned fruits and vegetables, Platt & Co. 54,523
Canned succotash, Burnham & Morrill Co. 54,492
Capsules, J. M. Grosvenor & Co. 54,599
Cards and posters, pictorial post, congratulatory, and fancy, Chromolithographische Kunstanstalt Paul Finkenrath, Gesellschaft mit beschrankter Haftung 54,653
Cards, playing, New York Consolidated Card Co. 54,451, 54,452, 54,623
Carriages and wagons, I. S. Remson Mfg. Co. 54,711
Cassimeres, James Irving & Son 54,335
Catheters, stomach-tubes, and bougies, Johnson & Johnson 54,300
Catsup, relish, and chili sauce, tomato, E. Pritchard 54,628
Cement, hydraulic, Utica Hydraulic Cement Co. 54,487
Cement plaster, J. B. King & Co. 54,517
Cement, Portland, Thomas Millen Co. 54,437
Cement, Portland, Pacific Portland Cement Co. 54,476
Cement, Portland, Vulcanite Portland Cement Co. 54,537
Cement, Portland, Whitehall Portland Cement Co. 54,538
Ceresin, Ernst Schliemann's Export Ceresin Fabrik Gesellschaft m. b. Haftung 54,658
Chain repair links, Diamond Chain & Manufacturing Co. 54,702
Chains, ornamental watch and neck, O. M. Draper 54,355
Chemical preparations, La-Lo Manufacturing Co. 54,672
Chemicals, certain named, Brunner, Mond & Co. 54,612
Chisels and punches, Whitman & Barnes Manufacturing Co. 54,730
Chlorids and formaldehyde, compounds of, Shoemaker & Busch 54,631
Chocolate, chocolate candies, and preparations of chocolate and cocoas, Russ-Suchard & Cie 54,527
Chocolate, cocoa, and chocolate preparations, M. S. Hershey 54,497
Chocolates and cocoas, Russ-Suchard & Cie. 54,480
Cigarettes, Butler-Butler 54,442
Cigarettes, H. P. Strause 54,484
Cigarettes, Butler-Butler 54,493
Cigars, C. B. Perkins 54,478, 54,479
Cigars, S. Spiegel 54,483
Cigars, Carreras Limited 54,507
Cigars, cheroots, and cigarettes made of cigar tobacco, Cayey-Caguas Tobacco Co, 54,508, 54,544
Cigars, Havana, Havana Commercial Co. 54,496
Closet seat attachment, Specialties Sales Co. 54,726
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Coal, A. Y. Malcomson 54,640
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Coats, vests, trousers, and overcoats, Brokaw Bros. 54,542
Cocoa and chocolate, preparations of, Chas. H. Phillips Chemical Co. 54,423
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Coffee, Sprague, Warner & Co. 54,392
Coffee, Chase & Sanborn 54,403
Coffee, Merchants Coffee Company of New Orleans 54,520
Coffee, roasted and roasted and ground, Enterprise Coffee Company of Baltimore City 54,547
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Condensers, surface and jet, Wheeler Condenser & Engineering Co. 54,316
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Cordial, Societe Anonyme de la Distillerie de la Liqueur Benedictine de l'Abbaye de Fecamp ......54,405, 54,406, 54,416 to 54,418
Cordial, blackberry, H. R. Myers 54,756
Corn cure, Elgin Chemical Co. 54,326
Corn huskers, adjustable, F. D. Kees Manufacturing Co. 54,755
Corsets, Feilheimer and Co. 54,548
Cotters, spring, Whitman & Barnes Manufacturing Co. 54,260
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Cotton piece goods, Tremont & Suffolk Mills. 54,296
Cotton piece goods, York Manufacturing Co. 54,301
Cotton piece goods, Massachusetts Cotton Mills 54,558, 54,559
Cough cure, F. L. Gray 54,598
Cream separators, centrifugal, International Harvester Company of America 54,515
Creamers, gravity, J. S. Barth 54,371
Cutlery, certain named, A. J. Jordan 54,754
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Depilatory powders, F. T. Hopkins 54,663
Dress shields, Kora Co. 54,555
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Fabrics, certain named dress, O. Seyd 54,562
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Fertilizers, Virginia-Carolina Chemical Co., 54,438, 54,439, 54,455 to 54,457, 54,488, 54,505, 54,648
Fertilizers, artificial, Cloverine Fertilizer Co. 54,466
Fiber ware, indurated, United Indurated Fibre Co. of New Jersey 54,688, 54,689
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Fireworks, torpedo, E. H. Wagner 54,347
Fish, salted and boneless, J. W. Beardsley's Sons 54,554
Flavoring extracts, Oklahoma Wholesale Grocer Co. 54,625
Flour, self-rising, E. G. Richards 54,388
Flour, wheat, Mohns-Frese Commercial Co. 54,381
Flour, wheat, Monarch Milling Co. 54,382
Flour, wheat, Rea-Patterson Milling Co., 54,386, 54,387
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Flour, wheat, Falk Mercantile Co. 54,404
Flour, wheat, Lawrenceburg Roller Mills Co. 54,470
Flour, wheat, New London Milling Co. 54,502
Flour, wheat, Northwestern Consolidated Milling Co. 54,503
Flour, wheat, John F. Meyer & Sons Milling Co. 54,516
Flours and meals, American Cereal Co. 54,635
Fluid meters, Hersey Manufacturing Co. 54,749
Food for infants and invalids, prepared, Wells & Richardson Co. 54,587, 54,588
Food, infants', H. Taylor 54,395
Food, wheat breakfast, Pillsbury-Washburn Flour Mills Co. 54,627

Foods, certain named cereal, American Cereal Co. 54,541, 54,568
Foods made from oats, cereal, American Cereal Co. 54,401
Foods, poultry, A. E. Tate 54,534
Foods, prepared cereal breakfast, Hygienic Food Co. 54,376
Fruits, dried, L. Otsen & Co. 54,378
Fruits, dried, G. Frank 54,427
Garments, sleeping, Goodwin Durrell Co. 54,330
Gas burners, H. Adler Co. 54,574
Gin, Straus Gunst & Co. 54,686
Gin, Chicago Distilling Co. 54,736
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Glue cement, L. W. Ferdinand 54,467
Golf clubs, metal heads of, T. Stewart 54,645
Graphite, pulverized, United States Graphite Co. 54,454
Guitars and zithers, Lyon & Healy 54,518
Gum, chewing, American Chicle Co. 54,461
Gum, chewing, Bon-Bon Company 54,463
Gum, chewing, American Chicle Co. 54,506
Hair dressing, J. B. C. Balme 54,263
Hair pins, G. Littleford 54,715
Hair pins, S. Beaumont & Fils 54,734
Hair tonic, Weindorf & Co. 54,633
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Heating and cooking appliances, H. Adler Co. 54,278
Holders, certain named, J. P. Eustis Mfg. Co. 54,753
Hops, Chas. L. Kiewert Co. 54,424
Hose, New Jersey Car Spring & Rubber Co. 54,340
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Hosiery, Marshall Field & Co. 54,641
Hosiery for both ladies and gentlemen, Wayne Knitting Mills 54,649
Hydrogen peroxid, American Peroxide and Chemical Co. 54,651
Illusion apparatus, mechanical, E. Renton 54,344
Ink eradicators, B. R. Thomas 54,586
Inks and printing ink varnishes and dry colors, printing and lithographing, Jaenecke Printing Ink Co. 54,604
Inks, copying, indelible, and writing, S. S. Stafford, Inc. 54,294
Insecticides, B. G. Pratt Co. 54,343
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Knives and razers, Wester Bros. 54,458
Knives and razors, A. Baldwin & Co. 54,696
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Lard, Golden and Co. 54,510
Lards, J. & F. Schroth Packing Co. 54,377
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Metals or alloys, antifriction, Magnolia Metal Co. 54,717
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Milk, condensed, Pacific Coast Condensed Milk Co. 54,383
Milk, condensed, Vermont Condensed Milk Co. 54,397, 54,398
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Mowers, lawn, Whitman & Barnes Manufacturing Co. 54,258
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